World Journal of Biology Pharmacy and Health Sciences, 2020, 04(03), 043–047

World Journal of Biology Pharmacy and Health Sciences

e-ISSN: 2582-5542, Cross Ref DOI: 10.30574/wjbphs

Journal homepage: http://www.wjbphs.com

(RESEARCH ARTICLE)

Evaluation of antimicrobial potential and phytochemical screening of *Moringa oleifera* leave extract: An Emerging folkloric medicinal plant in Maiduguri, Borno state, Nigeria

Fatima Adamu Lawan [1,*], Binta Baba Shehu [2], Ali Abba Gana Benisheikh [3], Abba Mohammad Dige [4], Hassan Arabi Jidda [5] and Abdullahi Abdulkadir [6]

[1] *Department of Veterinary Microbiology, Faculty of Veterinary Medicine, University of Maiduguri, Nigeria*
[2] *Department of Biochemistry, Faculty of Sciences, University of Maiduguri, Borno state, Nigeria*
[3] *Department of Applied Microbiology and Biotechnology, Faculty of Science and Engineering, University of Wolverhampton, United Kingdom/ Centre for Biotechnology, University of Maiduguri, Borno state, Nigeria*
[4] *North East Zonal Biotechnology Centre of Excellence, University of Maiduguri, Borno state, Nigeria*
[5] *Department of Microbiology, Faculty of Science, University of Maiduguri, Borno state, Nigeria*
[6] *Department of Biological Sciences, Faculty of Science, University of Maiduguri, Borno State, Nigeria*

Publication history**:** Received on 18 November 2020; revised on 30 November 2020; accepted on 02 December 2020

Article DOI: https://doi.org/10.30574/wjbphs.2020.4.3.0096

Abstract

The aim of this study was to evaluate the antimicrobial potential and phytochemical screening of *Moringa oleifera* leave extract as folkloric medicinal alternative. The phytochemical screening result revealed the presence of Alkanoids, Saponins, Fats & oil, Terpenoids and Tanin in all the solvents used for the study. Agar-disc diffusion method were used to determine the antimicrobial activities of the *Moringa oleifera* extracts on microorganisms. Maximum activities of inhibition were recorded on Ethyl acetate (50mg/ml) against *Pseudomonas auroginusa*, moderarate activities against *Escherichia coli*. Likewise 50mg/ml of Haxane extract show weak activities on Pseudomonas aeruginosa, moderate in both *Staphalococcus aureus* and *Escherichia coli*. Whereas 50mg/ml of Methanol show moderate activity on Pseudomonas aeruginosa, *Staphalococcus aureus* and weak activities on *Escherichia coli* respectively. The research revealed that *Moringa oleifera* bioactive components would be a safer alternative for curative and preventive emerging folkloric medicinal plant for treatment of bacterial ailments in Maiduguri, Borno state, Nigeria.

Keywords: Phytochemical Screening; Antimicrobial Potential; *Moringa oleifera*; An Emerging Folkloric; Medicinal Plant; Maiduguri; Borno State.

1. Introduction

Moringa oleifera L. well known as "horse radish" or Zogole tree by the traditional medicine practitioners in Nigeria. Recent literatures indicated that the genus Moringa consist of about fourteen species which wide spread worldwide [1]. According to Diana Meireles [2]; Zongo [3]; Valdez-Solana et al. [4] Gopalakrishnan [5]; Debajyoti et al. [6] *Moringa oleifera* is widely used as a source of nutritional supplement and traditional medicine in developing countries in Africa like Nigeria. Since time immemorial medicinal plants served as potential source of first information of phytochemical constituent, bioactive ingredient and reservoirs for subsequent for the production of chemotherapy drugs for human and animal use [7]. The medicinal properties of *Moringa oleifera* could be attributed to the presence of antioxidant, antimicrobial and antipyretic effects of the phytochemicals and bioactive ingredients of the plant extracts. The presence of phytochemical and bioactive ingredients such as tannins, flavonoids, Saponins etc [8]. The recent advancement in technological and scientific research on plant components has tremendously increased the use of medicinal plants such

* Corresponding author: Fatima Adamu Lawan
Department of Veterinary Microbiology, University of Maiduguri.

as *Moringa oleifera* as mean of remedy of enormous ailment of animal and humans [9]. *Moringa oleifera* which belong to the family moringaceae is widely present in most African countries due to its nutritional and medicinal importance, populace in this region cultivated it widely in their backyard for immediate use [10]. According to Bharali et al, [11] the crude leave extract of *Moringa oleifera* has been proven to reduce tumors in experimental animals. Further research is highly recommended since antimicrobials of plant sources has shown therapeutic ability in the treatment of most infectious diseases in the study area.

2. Material and methods

2.1. Sample collection

The crude leaves of *Moringa oleifera* were collected from University of Maiduguri quarters. The plant was identified accordingly using the key to taxa in the library.

2.2. Determination of antimicrobial activity

The test organisms (*Staphalococcus aureus*, *Pseudomonas aeruginosa*, and *E. coli*, were obtained from the microbiology laboratory. The following selective agar media were used for the antimicrobial test: Baird-Parker (*S. aureus*), Cetrimide (*P. aeruginosa*), McConkey (*E. coli*),

2.3. Preparation of crude leaf extract

The collected leaves were chopped into small pieces and coarsely grounded into powdered with suitable homogenizer. The powdered extract was collected and run for successive extraction with various organic solvents by using Soxhlet extraction method [12]. The extracts were collected and distilled off on a water bath at atmosphere pressure. The extracts obtained were subjected to phytochemical assay and antimicrobial activities were monitored.

2.4. Phytochemical Screening

Phytochemical screening of the crude leaf extract of *Moringa oleifera* were assessed for the presence or absence of secondary metabolites such as flavonoids, steroidal compounds, phenolic compounds as described by Sood et al. [13] and Chhetri et al. [14] with little modifications.

2.5. Test for Alkaloids

Detection of alkaloids from crude leaf extracts of *Moringa oleifera*: The extract was dissolved in dilute hydrochloric acid and solution was clarified by filtration. Mayer's test was conducted by treating filtrate with Mayer's reagent (potassium mercuric loidide). The presence of alkaloids was determined by formation of a yellow precipitate, followed by Wagner's test which indicated the presence of alkanoid by production of brown/reddish precipitate as described by *Benisheikh et.al [15]; Siddiqui and Ali, [16].*

2.6. Detection of phenols from crude leaf extracts of *Moringa oleifera*

Ferric chloride test was carried out to determine the presence of phenol. Three drop of 1% ferric chloride and potassium ferocynide was added. The presence phenol was determine by formation of bluish-green colour, whereas little quantity of methanol extract was dissolved in water and few crystal of ferric sulphate was added to the mixture to determine presence of phenol by production of dark-violet coloration [17];[18].

2.7. Detection of fatty acids

The *Moringa oleifera* leave extract was mixed with 5 ml of ether and allow for evaporation on filter paper to dry. The appearance of transparence on the filter paper indicates the presence of fatty acids as described by Siddiqui and Ali, [19]

2.8. Detection of Saponin

For the detection of saponin foam test was conducted by using 50mg of dry powder diluted with distilled water. After vigorous shaken of the suspension for about 15 minutes a layer of thick foam was formed indicating the presence of Saponin in the extract [20].

2.9. Antimicrobial Assay

The antimicrobial properties of the extracts were determined using the agar-disc diffusion method.

3. Results and Discussion

The preliminary screening of phytochemical compounds of *Moringa oleifera* served as the mean for the evaluation of potential antimicrobial activity of crude leave using Hexane, Chloroform, ethyl acetate and Methanol (Table 1). Higher activity was recorded in Hexane leave extract when tested for the presence of Alkanoids, tanins, phenol, saponins, terpenoids and lipids, fats and oils, this is in analogy with recent study by Malliga Elangovan et al, [21] while in Methanol leave extracts Saponins, Tanins & phenol and lipids,fats & oil were in higher concentration, followed by Terpenoids present at moderate concentrations. Whereas moderate concentration was recorded in Terpenoids and not present in Alkanoid, Saponins and lipids, fats & oil using chloroform solvent. Likewise alkanoids, saponins, Lipids, fats & oil, Terpenoids and Tanins & phenol using Ethyl acetate solvents not present at all. The data on phytoconstituents using bioassay different parts of plants are as shown in Table. 2 below. The results revealed that higher concentration of alkanoids, flavonoids, fatty acids using mayer's reagents, ferric chloride and fats by dropping mixture of ether on filter paper and moderate concentration of Saponins were obtained by formation of thick form on seeds extracts. Likewise moderate concentration were recorded in all roots & leaf extracts of Alkanoids, flavonoids, saponins and fatty acids when meyer's reagents, ferric chloride test and formation of thick form were observed. The results on antimicrobial activities of *Moringa oleifera* against Pseudomonas aeruginosa, *Staphalococcus aureus* and *Escherichia coli* as shown in Table 3. The data collected on ethyl acetate (50mg/ml) Moringa leaf extract revealed maximum activities against pseudomonas, moderate activities against *Staphalococcus aureus* and weak activities against *Escherichia coli*. Likewise moderate activities was obtained in chloroform extract on Pseudomonas aeruginosa, *Staphalococcus aureus* and weak activities on *Escherichia coli*. Whereas antimicrobial activities of hexane 50mg/ml show weak activities on Pseudomonas aeruginosa, moderate activities in *Staphalococcus aureus* and *Escherichia coli* respectively. The result of methanol 50mg/ml indicated that moderate activity on Pseudomonas, Staphalococcus and weak activities on *Escherichia coli* respectively. Previous studies has showed that *Moringa oleifera* is a potential folklore plant with higher antimicrobial against Pseudomonas aeruginosa, *Staphalococcus aureus* and *Escherichia coli* [22].

Table 1 Phytochemical analysis of crude leave extracts of *Moringa oleifera*

Phytochemical compounds	Hexane	chloroform	Methanol	Ethyl acetate
Alkaloids	+++	-	-	-
Saponins	++	-	+++	-
Fats& oil	++	-	+++	-
Terpenoids	++	++	++	-
Tanins	+++	++	+++	-

(+): present at low concentration, (++): present at moderate concentration, (+++): present at high concentration (-): Not present

Table 2 Phytoconstituent bioassay of different plants parts

		Plant parts used		
Phytoconstituent	Bioassay test	Leaf	Seeds	Root
Alkanoids	Mayer's reagent	**	***	**
Flavonoids	Ferric chloride test	**	***	**
Saponins	Formation of thick foam	**	**	**
Fatty acids	Drop of mixture of ether &extract filtered on filter paper	**	***	**

(*): present at low concentration, (**): present at moderate concentration, (***): present at high concentration (0): Not present

Table 3 Antimicrobial activity (zone of inhibition) of different phytochemical components of leave extracts

Name of the organism	Hexane 50mg/ml	Chloroform 50mg/ml	Methanol 50mg/ml	Ethyl acetate 50mg/ml
Pseudomonas aeruginosa	12	17	14	20
Staphalococcus aureus	16	15	15	16
Escherichia coli	15	12	12	11

Key: 20mm-27mm (higher zone of inhibition), 14mm-17mm (moderate zone of inhibition), 10mm-12mm (weak zone of inhibition).

4. Conclusion

It was concluded from the study that *Moringa oleifera* leave extract is a potential folkloric plant with higher antimicrobial activities against common illness caused by Pseudomonas aeruginosa, Staphalococcus aureus and Escherichia coli in the study area.

Compliance with ethical standards

Acknowledgments

The authors would like to appreciate the indefatigable technical support by the laboratory staffs of Department of Microbiology, University of Maiduguri, Borno state, Nigeria,

Disclosure of conflict of interest

All the authors declare that they have no conflict of interest.

References

[1] Rani A, Husain K, Komolososasasoi E (2018) Moringa genus: a review of phytochemistry and pharmacology. Front pharmacol 9 (108): 1-26.

[2]

[3] Zongo UZL, Savadogo A, Traoré AS Nutritional and clinical rehabilitation of severely malnourished children with *Moringa oleifera* Lam. Leaf powder in Ouagadougou (Burkina Faso). Food Nutr Sci 2013; 4:991–997

[4] Valdez-Solana MA, Mejía-García VY, Téllez-Valencia A, García-Arenas G, Salas-Pacheco JS, Alba-Romero JJ, Sierra-Campos E 2015 Nutritional content and elemental and phytochemical analyses of *Moringa oleifera* grown in Mexico. J Chem. https://doi.org/10.1155/2015/86038 1

[5] Gopalakrishnan L, Doriya K, Kumar DS *Moringa oleifera*: a review on nutritive importance and its medicinal application. Food Sci Human Wellness 2016; 5:49–56

[6] Debajyoti D, Dipsundar S, Dinesh B, Chandreyee R, Sanatan R, Jayram H *Moringa olifera* (shigru): a miracle tree for its nutritional, ethnomedicinal and therapeutic importance. Int J Dev Res—IJDR 2017; 07(11):16823–16827

[7] MANJULIKA YADAV, SANJUKTA CHATTERJI, SHARAD KUMAR GUPTA AND GEETA WATAL 2013 PRELIMINARY PHYTOCHEMICAL SCREENING OF SIX MEDICINAL PLANTS USED IN TRADITIONAL MEDICINE International Journal of Pharmacy and Pharmaceutical Sciences 2014; Vol 6, Issue 5:ISSN- 0975-1491,

[8] Hill, A.F. Economic Botany. A Textbook of useful plants and plant products, 2nd edn, McGraw – Hill Book Company Inc, New York. 1952; pp.32-35.

[9] Bharali, B, Tabassun J, and Azad,M.R.H, Chemo-modulatoy effect of moringan oleifera ,I am on hepatic carcinogen metabolizing enzymes, antioxidant paramates and skin, papillomanganesis in mice.Asian Pacific Journal of cancer Prevention 2003; 7:133-139.

[10] Ijiako, E.N 2014 The International Journal Of Engineering And Science (IJES), ||Volume||3 ||Issue|| 3||Pages|| 32-35||2014||, ISSN(e): 2319 – 1813 ISSN(p): 2319 – 1805, Phytochemical Analysis and Antimicrobial Screening Of *Moringa oleifera* Leaves Extract

[11] Bharali, B, Tabassun J, and Azad,M.R.H, Chemo-modulatoy effect of moringan oleifera ,I am on hepatic carcinogen metabolizing enzymes, antioxidant paramates and skin, papillomanganesis in mice.Asian Pacific Journal of cancer Prevention 2003; 7:133-139

[12] Harbone JB. Phytochemical Methods, Chapman & Hall, London; 1999; p. 60-66.

[13] Sood A, Kaur P, Gupta R Phytochemical screening and antimicrobial assay of various seeds extract of Cucurbitaceae family. Int. J. Appl. Bio. Pharm. Technol. 2012; 3(3):401-409.

[14] Chhetri HP, Yogol NS, Sherchan J, Anupa KC, Mansoor S, Thapa P Phytochemical and antimicrobial evaluations of some medicinal plants of Nepal. Kathmandu University J. Sci. Eng. Technol. 2008; 1:49-54.

[15] A.A.G. Benisheikh, Fatimah Maina Muhammad, Harun Kelluri, Zainab Mudi Aliyu, Umar Baba Mallam, Mallam Wali Jibrin Phytochemical Extraction and Antimicrobial Studies on Crude Leaf Extract of *Azadirachta indica (Neem)* in Semi-Arid Region of Borno State, Nigeria International Journal of Research and Review E-ISSN: 2349-9788; P-ISSN: 2454-223 www.ijrrjournal.com

[16] Siddiqui AA, Ali M. Practical pharmaceutical chemistry. 1st ed.; CBS publishers and Distributors, New Delhi, 1997; PP. 126-31.

[17] Mace ME. Histochemical localization of phenols in healthy and diseased tomato roots. Phytopathology 1963; 16:915-925.

[18] A.A.G. Benisheikh, Fatimah Maina Muhammad, Harun Kelluri, Zainab Mudi Aliyu, Umar Baba Mallam, Mallam Wali Jibrin Phytochemical Extraction and Antimicrobial Studies on Crude Leaf Extract of *Azadirachta indica (Neem)* in Semi-Arid Region of Borno State, Nigeria International Journal of Research and Review E-ISSN: 2349-9788; P-ISSN: 2454-223 www.ijrrjournal.com

[19] Siddiqui AA, Ali M. Practical pharmaceutical chemistry. 1st ed.; CBS publishers and Distributors, New Delhi, 1997; PP. 126-31.

[20] Sudhapriya. A, and R. Dhivya, 2019 Phytochemical Screening and Larvicidal Efficacy of Solvent Extracts of Delonix regia Leaf and Flower against Vector Mosquito Culex quinquefasciatus International Journal of Research and Review E-ISSN: 2349-9788; P-ISSN: 2454-2237

[21] Malliga Elangovan, Dhanarajan. M. S, Rajalakshmi A, Jayachitra A, Pardhasaradhi Mathi, Narasimharao Bhogireddy, Analysis of Phytochemicals, Antibacterial and Antioxidant activities of *Moringa oleifera* Lam. Leaf extract- an in vitro study October - December 2014; Vol. 6 Issue 4:ISSN 0975-9344 |

[22] Amabye TG, Tadesse FM. Phytochemical and antibacterial activity of *Moringa oleifera* available in the market of Mekelle. *J Anal Pharm Res.* 2016; 2(1):23–26. DOI: 10.15406/japlr.2016.02.00011