**International Journal of Botany Studies**
**www.botanyjournals.com**
**ISSN: 2455-541X**
**Received: 04-10-2021, Accepted: 18-10-2021, Published: 17-11-2021**
**Volume 6, Issue 6, 2021, Page No. 56-59**

# *In vitro* antibacterial activity evaluation of *Moringa oleifera* (Lam.) leaf extracts

**Benila S[1], R Ragel Mabel Saroja[2]**
[1] Research Scholar, Department of Chemistry, Scott Christian College (Autonomous), Nagercoil, Affiliated to Manonmaniam Sundaranar University, Abishekapatti, Thirunelveli, Tamil Nadu, India
[2] Associate Professor and Head, Department of Chemistry, Scott Christian College (Autonomous), Nagercoil, Affiliated to Manonmaniam Sundaranar University, Abishekapatti, Thirunelveli, Tamil Nadu, India

**Abstract**
The present study is to evaluate the antibacterial activity of *Moringa oleifera* leaf in different solvent extracts such as ethanol, methanol, acetone and diethyl either. *Moringa oleifera* is an ever green medicinal plants tested again six gram negative bacteria such as *Escherichia coli, Klebsiella pneumonia, Pseudomonas aeruginosa, Proteus mirabilis, Serratia marcens, Shigella flexneri*,and gram positive bacteria such as *Enterococcus faecalis, Bacillus subtilis, Bacillus cereus, Staphylococcus aureus, Staphylococcus albus* and *Streptococcus agalactiae* were taken for this study. Based on the results described we may conclude that ethanolic and methanolic extract of *Moringa oleifera* (Lam.) possess significant antimicrobial activity. The results obtained also revealed that *Moringa oleifera* (Lam.) could serve as a useful source of new antibacterial agent.

**Keywords:** *Moringa oleifera*, antibacterial activity, gram negative bacteria, gram positive bacteria

## Introduction
Plants that are traditionally used in the treatment of bacterial and fungal infections or related ailments could be a good source for new safer drugs and could offer potential lead in the development of novel herbal medicines that are active against pathogenic microorganisms (Arumugam *et al*., 2012) [3]. The growing prevalence incidences of multi-drug resistant microorganisms and the recent appearance of new microbial strains resistant to almost all known antibiotics are alarming and necessitated the international scientific community to apply different strategies and search for new effective drugs from another sources such as plants and natural products (Kochuthressia *et al*., 2012) [6]
The *Moringa* tree is cultivated and use as a vegetable (leaves, green pods, flowers, roasted seeds), for spice (mainly roots), for cooking and cosmetic oil (seeds) and as a medicinal plant (all plant organs) (Rebecca *et al*., 2006) [9]. All parts of the *Moringa* tree are edible and have long been consumed by humans (Fuglie, 1999) [5]. *Moringa oleifera* is a highly valued plant, distributed in many countries of the tropics and subtropics. It has impressive range of medicinal uses with high nutritional value. Different parts of this plan contain a profile of important minerals, and a good source of protein, vitamin, â carotene, amino acids and various phenolics (Farooq *et al*., 2007) [4]. Innumerable antibacterial agents are currently employed in treating bacterial infections. In addition to the cost and health effects discussed above, many of the currently used antibacterial agents are associated with adverse effects such as toxicity, hypersensitivity, immunosuppression, and tissue residues posing public health menace (Alikwe*et al*., 2013). In the present analysis, efforts were to compare the antimicrobial activity of different solvent extracts of *Moringa oleifera* for significant results. The antimicrobial study was carried out using 10 bacterial strains Among the 12 bacterial pathogens 6 were Gram positive and 6 were Gram negative bacteria.

## Materials and Methods
The plant selected for the study *Moringa oleifera*. was collected from Nesarpuram, Kanyakumari District, Tamilnadu. The plant was identified taxonomically. Fresh plant parts were washed thoroughly 2-3 times with running tap water and then with sterile water. Then it was shade-dried, powdered and used for extraction.

### Selection of Pathogens
Human pathogenic bacteria such as *Escherichia coli, Klebsiella pneumonia, Pseudomonas aeruginosa, Proteus mirabilis, Serratia marcens, Shigella flexneri, Enterococcus faecalis, Bacillus subtilis, Bacillus cereus, Staphylococcus aureus, Staphylococcus albus* and *Streptococcus agalactiae* were collected from Scudder Laboratory, Nagercoil. All the test bacterial strains were maintained on nutrient agar media. Amikacin was the standard control used for the present research.

### Preparation of Extracts
The plant parts were washed with clean water and air dried for 5 days. The dried leaves were stored in sealed and labelled containers for use. 20 gms of the plant parts were suspended in 120 ml of 98% ethanol and left for 24 hours. Thereafter, the suspensions were filtered into sterile containers separately using Whatmann No. 1 filter paper. The extracts were allowed to dry at a temperature of 40$^{o}$C into powder.
The powder of the extracts obtained were stored in sealed bottles and kept in a refrigerator at 4$^{o}$C until further use as per the method followed by Akerele *et al.* (2008) [1].

### Method of Antibacterial Activity
Antibacterial activity of aqueous extract and solvent extracts (acetone, ethanol, methanol and diethyl ether) were

determined by disc diffusion method on nutrient agar medium (Anonymous, 1996).

## Results and Discussion

The current research revealed that there are significant variations in antibacterial activities in different solvents of *Moringa oleifera* (Lam.). Ethanolic leaf extract of *Moringa oleifera* (Lam.) had a higher zone of inhibition *Enterococcus faecalis* (15mm) followed by *Shigella flexneri* (14mm). Prior findings of Koruthu *et al*. (2011) and Bukar *et al*. (2010) reported significant activity in ethanol extract of *Moringa oleifera* (Lam.). Apart from ethanol extract, methanol and chloroform extract showed significant antibacterial activity. Among the six Gram –ve bacterial strains *Shigella flexneri* was highly inhibited my all the solvents. *Serratia marcens* and *Escherichia coli* were also showed better results in all the solvents. Very low activity was noticed against *Klebsiella pneumoniae*. While comparing the Gram positive bacterial strains *Enterococus faecalis* was highly inhibited and 15mm zone of inhibition was recorded in ethanol extract. Moderate activity was noticed in *Bacillus cereus* and *Staphylococcus aureus*. This activity against both gram negative and gram positive bacteria may be attributed to presence of some broad-spectrum antibacterial compounds (Abdallah 2016). Gram-negative bacteria have been found to be a smaller amount susceptible to plant extracts in previous studies done by many researchers (Rahman, 2009; Abdallah, 2016). The peptide may act directly on microorganisms and result in growth inhibition by disrupting cell membrane synthesis or synthesis of essential enzymes (Silvestre *et al*., 2000; Suarez *et al*., 2003) [11].

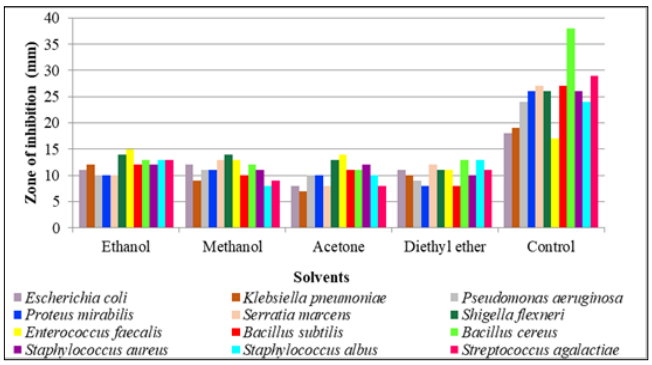


**Fig 1:** Antibacterial activity of *Moringa oleifera* (Lam.) extracts against selected bacterial pathogens

Among the selected solvents the significant antibacterial activity was recorded against *Enterococcus faecalis* in ethanol extract. The zone of inhibition was 15mm. Previous findings of various authors reported ethanol extract of *Moringa oleifera* (Lam.) leaves showed the extensive antibacterial effect against different bacterial strains (Nepolean *et al*., 2009; Peixoto *et al*., 2011) [7, 8].

**Table 1:** Antibacterial activity of *Moringa oleifera* (Lam.) extracts against Gram positive bacteria

| Pathogens | Solvents | | | | |
|---|---|---|---|---|---|
| | Ethanol | Methanol | Acetone | Diethyl ether | Control |
| *Enterococcus faecalis* | 15 | 13 | 14 | 11 | 17 |
| *Bacillus subtilis* | 12 | 10 | 11 | 8 | 27 |
| *Bacillus cereus* | 13 | 12 | 11 | 13 | 38 |
| *Staphylococcus aureus* | 12 | 11 | 12 | 10 | 26 |
| *Staphylococcus albus* | 13 | 8 | 10 | 13 | 24 |
| *Streptococcus agalactiae* | 13 | 9 | 8 | 11 | 29 |

**Table 2:** Antibacterial activity of *Moringa oleifera* (Lam.) extracts against Gram negative bacteria

| Pathogens | Solvents | | | | |
|---|---|---|---|---|---|
| | Ethanol | Methanol | Acetone | Diethyl ether | Control |
| *Escherichia coli* | 11 | 12 | 8 | 11 | 18 |
| *Klebsiella pneumoniae* | 12 | 9 | 7 | 10 | 19 |
| *Pseudomonas aeruginosa* | 10 | 11 | 10 | 9 | 24 |
| *Proteus mirabilis* | 10 | 11 | 10 | 8 | 26 |
| *Serratia marcens* | 10 | 13 | 8 | 12 | 27 |
| *Shigella flexneri* | 14 | 14 | 13 | 11 | 26 |

It can be inferred that *M. oleifera* leaf ethanol extract had the broad spectrum of activity against the tested pathogens. Further research must be carried out to isolate, purify and characterize the active principle responsible for the antibacterial activity.

Similarly, additional work should be boarded upon with a view to explain the possible mechanism of the leaves extract.

## Conclusion

In the following few decades, plant product based drugs or medicines may become a new era of medical system for the management of human diseases without any side effects. Hence the present work was carried out with the aim to know the bioactivity of *Moringa oleifera* (Lam.) against known pathogens. In *Moringa oleifera* (Lam.) the maximum inhibition zone was recorded mainly in the ethanol and methanol extract. There is a need to advance research for the development and characterization of new natural drugs with the aid of better screening methods from plants and other natural sources.

### Inhibition of *Moringa oleifera* (Lam.) leaf extracts in different solvents

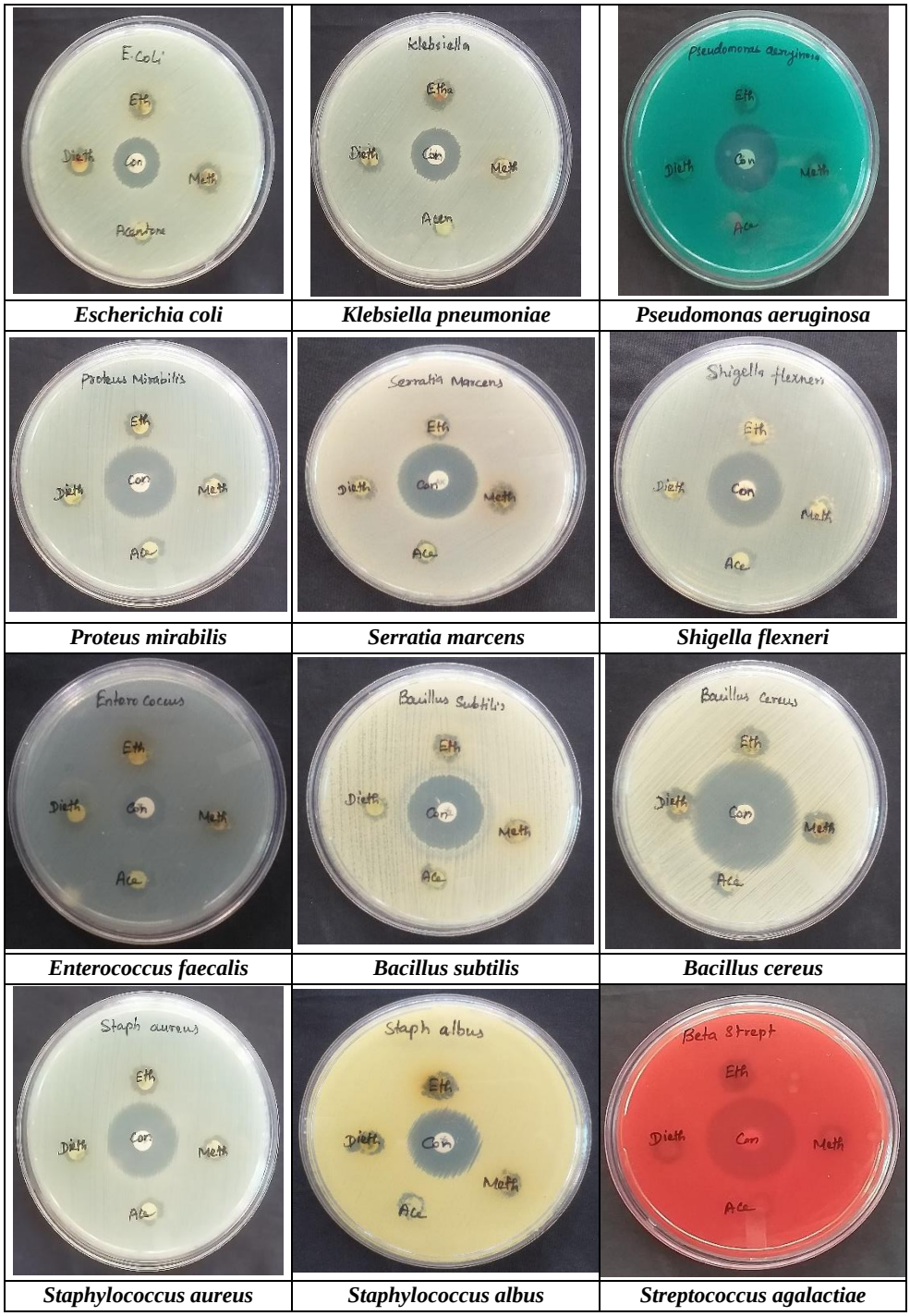


**Fig 2**

## References


1. Akerele JO, Obasuji O, Ebomoyi MI, Oboh IE, Uwumarongie OH. 'Antimicrobial activity of ethanol extract and fractions of the seeds of *Garcinia kola* Heckel. (Guttiferae)', African Journal of Biotechnology,2008:7(2):169-172.
2. Alikwe PCN, Omotosho, MS, 2013, 'An evaluation of the proximate and phytochemical composition of *Moringa oleifera* leaf meal as potential feedstuff for non-ruminant livestock', Agrosearch,2008:13(1):17-28.
3. Arumugam N, Kandasamy S, Sekar M. '*In-vitro* antifungal activity of *Hybanthus enneaspermus* F Muell.', International Journal of Pharmacy and Pharmaceutical Sciences,2012:4(2):594-596.
4. Farooq A, Sajid L, Muhammad A, Hassan GA. '*Moringa oleifera*: A food plant with multiple medicinal uses', Phytotherapy Research,2007:2:17-25.
5. Fuglie LJ. 'The Miracle Tree: *Moringa oleifera*: Natural Nutrition for the Tropics', Church World Service, Dakar,1999:1:68.
6. Kochuthressia KP, Britto SJ, Jaseentha MO, Rini R. '*In vitro* antimicrobial evaluation of *Kaempferia galanga* L. rhizome extract' American Journal of Biotechnology and Molecular Sciences,2012:2(1):1-5.
7. Nepolean P, Anitha J, Renitta RE. 'Isolation, analysis and identification of phytochemicals of antimicrobial activity of *Moringa oleifera* Lam.', Current Biotica,2009:3(1):33-39.

8. Peixoto JRO, Silva GC, Costa RA, Fontenelle JLS, Vieira GHF, Filho AAF *et al*. RHSF '*In vitro* antibacterial effect of aqueous and ethanolic *Moringa* leaf extracts', Asian Pacific Journal of Tropical Medicine, 2011, 201-204.
9. Rebecca HSU, Sharon M, Arbainsyah A, Lucienne D. '*Moringa oleifera*: medicinal and socio-economic uses' International Course on Economic Botany, National Herbarium Leiden, Netherlands, 2006, 2-6.
10. Silvestro L, Weiser JN, Axelsen PH. 'Antibacterial and antimembrane activities of cepropin A in *Escherichia coli*', Antimicrobial Agents and Chemotherapy,2000:44:602-607.
11. Suarez M, Entenza JM, Dorries C. 'Expression of a plant – derived peptide harbouring water – cleaning and antimicrobial activities', Biotechnology and Bioengineering,2003:81:13-20.