ANTIBACTERIAL ACTIVITIES AND PHYTOCHEMICAL SCREENING ON THE FLOWERS OF MORINGA OLEIFERA LAM.

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ABSTRACT

Plant based drugs are the prehistoric practice of healthcare, famous to humankind. The plant based drugs are identified and collected from plants through several processes. Therefore the present investigation provides the efficacy of *Moringa oleifera* Lam. flowers. The antibacterial activity and phytchemical screening of *Moringa oleifera* flowers were determined using acetone, chloroform, ethanol, ethyl acetate, diethyl ether and aqueous extracts. The phytochemical screening revealed the presence of phytochemicals such as alkaloids, flavonoids, phenols, saponins, steroids, terpenoids, tannins and glycosides. The selected bacterial pathogens are *Klebsiella pneumoniae, Salmonella typhi*, *Proteus mirabilis*, *Escherichia coli* and *Pseudomonas aeruginosa*. The flower extracts were prepared and antibacterial study was carried out using disc diffusion method. Among the selected solvents Chloroform, ethyl acetate and ethanol extract showed significant activity. This may be due to the presence of various phytochemicals present in the flowers of *Moringa oleifera* Lam.

Keywords: Plant based drugs, Antibacterial, phytochemical, *Moringa oleifera* Lam.

INTRODUCTION

Medicinal plants could be a good alternative source for antibiotics are safe with little or no side effects, cost-effective and have the ability to affect a wide range of antibiotic resistant microorganisms (Sharma *et al*., 2009). In India, the use of plants to cure specific ailments has been in vague from ancient times (Chitravadivu *et al*., 2009).

Pharmacological studies have acknowledged the value of medicinal plants as potential source of bioactive compounds (Prusti *et al*., 2008).

Moringa oleifera is a small, fast-growing evergreen or deciduous tree that usually grows up to 10 to 12m in its height, open crown of drooping fragile branches, feathery foliage of trip innate leaves and thick corky, whitish bark (Roloff *et al*. 2009). *Moringa oleifera* Lam. is used as a highly nutritive vegetable in many countries. Its young leaves, flowers, seeds and tender pods are commonly consumed and they are having some medicinal properties (Monicapremi *et al*., 2010).

Moringa oleifera is regarded as miracle plant due to its multiple uses. Virtually, all the parts of the plant are edible and utilized as traditional diets in many countries of the tropics and subtropics (Farooq & Umer, 2007).

Seeds, leaves, oil, sap, bark, roots, and flowers are widely used in traditional medicine. (Moyo *et al*., 2011; Teixeira *et al*., 2014; Razis *et al*., 2014). Extracts from the dried or wet flowers and leaves of plants are applied as a paste on wounds in some rural communities (Alam *et al*. 2010; Midawa *et al*. 2011).

Thus the present investigation on the phytochemical screening and antibacterial activity of *Moringa oleifera* flowers were evaluated using different solvents and aqueous extracts.

MATERIALS AND METHODS

Collection of Plant Material

Fresh flowers of *Moringa oleifera* were collected from Marthandam, Tamilnadu, India during January 2018. The Flora of Presidency of Madras (Gamble, 1935) and The Flora of Tamil Nadu Carnatic (Matthew, 1983) were used for identification and authentication of the plants. Collected flowers were washed thoroughly in running tap water, rinsed in distilled water and shade dried in open air. The dried flowers were ground into a coarse powder and used for further studies

Preparation of Phytochemical Extracts

The powdered flowers of *Moringa oleifera* was sequentially extracted in different solvents like Acetone, Chloroform, Ethanol, Ethyl acetate, and Diethyl ether. Aqueous extract was also extracted. The extracts were filtered using Whatman filter paper no. 1 and the filtrates were then evaporated to dryness. Then the extracts were stored for further study.

Test Organisms

Klebsiella pneumoniae, Salmonella typhi, Proteus mirabilis, Escherichia coli and *Pseudomonas aeruginosa* were used to evaluate the antibacterial activity. All bacterial cultures were maintained in nutrient agar slants and sub-cultured periodically.

Antibacterial Activity Test

Antibacterial activity was tested using disc diffusion assay method of Bauer (1966) and Ncube *et al*. (2008). Plant extracts were dissolved in 20% DMSO treated water. The inoculums for each microorganism were prepared from nutrient broth cultures. A loop of culture from the nutrient agar slant stock was cultured overnight and spread with a sterile swab into Petri-plates. Sterile disc (6 mm) impregnated with the plant extracts were placed on the cultured plates and incubated for 24 h at 37ºC. Amikacin served as the standard control in the study. The results were recorded by measuring the zones of growth inhibition. Clear inhibition zones around discs indicated the presence of antibacterial activity.

RESULTS AND DISCUSSION

The medicinal property and pharmacological actions of *Moringa oleifera* flowers possessed good antibacterial activity confirming the great prospective of bioactive compounds and is constructive for balancing the use of this plant in primary health care.

Many of the previous findings are available on the antipyretic, antiulcer, anti-inflammatory, antiepileptic, antioxidant, antidiabetic, diuretic, antipyretic, antibacterial and antifungal properties of *Moringa oleifera* Lam. flowers (Raut *et al*., 2014; Siddhuraju and Becker, 2003; Tahiliani and Kar, 2000).

Flowers contain sucrose, amino acids, alkaloids, and flavonoids, such as rhamnetin, isoquercitrin, and kaempferitrin (Siddhuraju and Becker, 2003; Pramanik and Islam, 1998). Flavonoids, tannins, steroids, alkaloids, saponins, benzyl isothiocyanate, and benzylglucosinolate were found to be responsible for antimicrobial activity (Vinoth *et al*. 2012; Pinal *et al*., 2014).

Dried flower extracts were used for the present antibacterial and phytochemical analysis. Previous research findings also reported the preparation of dried flower extracts and its application against microbial pathogens (Kavimani *et al*., 2015; Marimuthu *et al*., 2014; Sumitha *et al*., 2015; Tatke *et al*., 2015).

The phytochemical analysis of *Moringa oleifera* shown the presence of various phytoconstituents (Table: 1). The chloroform and ethyl acetate extract revealed the presence of all the compounds except steroids. The phytochemical compounds such as alkaloids, phenols, saponins, steroids, tannins and glycosides were present in diethyl ether and ethanol extracts. Alkaloids, phenols, saponins, steroids, tannins and glycosides were present in acetone extracts. Aqueous extract revealed the presence some phytochemicals.

Table 1: Phytochemical analysis of *Moringa oleifera* Lam.

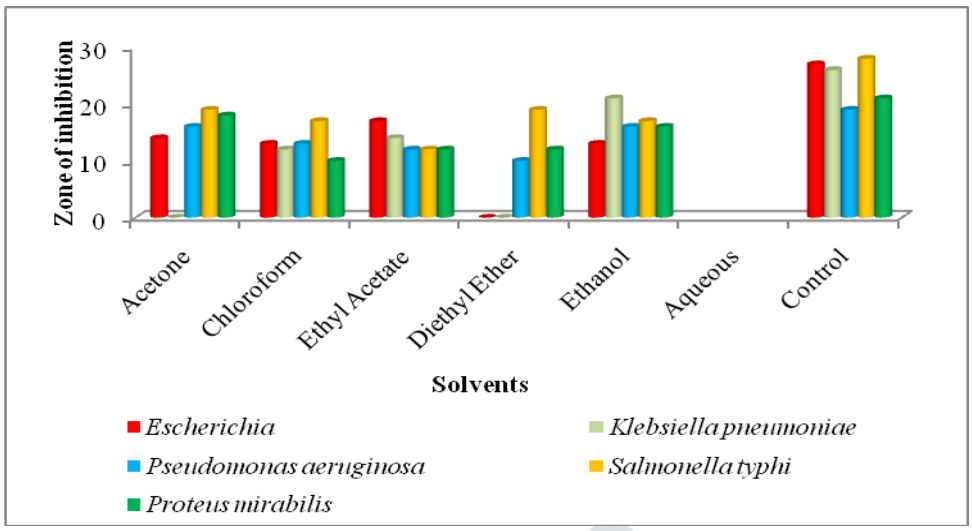
Phytochemicals	Solvent extracts					
	Acetone	Chloroform	Ethanol	Ethyl acetate	Diethyl ether	Aqueous
Alkaloids	++	++	++	+++	++	+
Flavonoids	-	++	-	+	-	++
Phenols	+	++	++	+	++	+
Saponins	+	+++	+++	++	+	+
Steroids	-	-	+	-	++	-
Terpenoids	-	++	-	+++	-	+
Tannins	+	++	++	+++	++	++
Glycosides	+	++	+++	++	+	+

+++ → High + → Low

++ → Moderate - → Absent

The potential sensitivity of the extract was obtained against all the bacterial pathogens tested and the zone of inhibition was recorded and presented below in the bar diagram (Figure 1).

Figure 1: *Moringa oleifera* Lam. extracts showing antibacterial activity



In the present investigation, the antibacterial of the different flower extracts of *Moringa oleifera* was assayed against five common bacterial pathogens to understand the most effective activity. The flower extracts of *Moringa oleifera* Lam. showed a broad-spectrum antibacterial activity with a zone of inhibition of 21mm in ethanol extract against *Klebsiella pneumoniae*. For ethyl acetate extract, the maximum zone of inhibition was obtained for *Escherichia coli* with 17mm inhibition zone. All the tested bacterial pathogens exhibited good sensitivity in ethanol extract followed by ethyl acetate and chloroform.

Our results are in agreement with the earlier findings of Singh and Navneet (2018) and Nepolean (2009).

Among the solvents used, ethanol extract showed better results. Vinoth *et al*., (2012) previously reported that the ethanolic extract was active against *Salmonella typhi* and *Staphylococcus aureus*.

CONCLUSION

The foremost objective of the present investigation was to unfold and explore the pharmacological and medicinal values of *Moringa oleifera* Lam. flowers. The ethanol extract of *Moringa oleifera* Lam. Flower showed significant antibacterial activity against all the pathogens. Also Chloroform and ethyl acetate extract showed highest activity. These activities may be endorsed to phytoconstituents present in its flowers. *Moringa oleifera* Lam. offers enormous value, which can form the origin of more drugs, and should be used for the support of public health. Therefore we suggest that in future the active components from the flowers of *Moringa oleifera* Lam. can be isolated, identified and characterized to find a new drug.

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