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Research Article

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Screening of antimicrobial activity of *Withania somnifera* and *Aloe vera* plant extracts against food borne pathogens

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ABSTRACT

Methanolic and aqueous extracts of plants Withania somnifera and Aloe Vera were tested for antibacterial activity against Pseudomonas aeroginosa, Bacillus cereus, E.coli, Salmonella typhi, Staphylococcus aureus and Klebsiella pneumoneae. Well diffusion method was used to test the antimicrobial activity. The results exhibited that the extracts of Withania somnifera and Aloe Vera were showed excellent antimicrobial activity against all the test organisms. Methonalic extracts of both the plants showed good antibacterial activity when compared to aqueous extracts. Gram positive bacteria found to be more sensitive than the gram negative bacteria. Phytochemical screening of plant extracts revealed the presence of various types of bioactive components such as alkaloids, tannins, flavonoids and glycosides, which might be responsible for exhibiting antibacterial activity.

Key words: Antimicrobial activity, Food borne pathogen, Withania *somnifera*, *Aloe Vera.*

INTRODUCTION

There is an increase in usage of antibiotics during past few decades worldwide due to development of multidrug resistance among the pathogenic bacteria [1]. Due to the emergence of multiple drug resistance in human pathogens has necessitated a search for new antimicrobial substances from other sources including plants. The problem of microbial resistance is growing and the outlook for the use of antimicrobial drugs in the future is still uncertain. To reduce these problems, it is necessary to develop new drugs, which might be either synthetic or natural. The synthetic drugs are associated with side effects; hence more emphasis should be given to develop safe, natural plant based drugs. According to World Health Organization [2], the medicinal plants would be the best source to obtain a variety of drugs. The use of plant extracts, with known antimicrobial properties, can be of great significance in the treatment of various microbial infections. The plant *Withania somnifera*, commonly known as "*Ashwagandha*" and *Aloe Vera* were well known for their therapeutic use in the Unani and Ayurvedic systems of traditional medicine [1]. In the developing countries, synthetic drugs are not only expensive and inadequate for the treatment of diseases, but also induce adverse side effects [3]. Therefore, there is the need to search for useful herbs. In the present study, the aqueous and methanolic extracts of *Withania somnifera* and *Aloe Vera* were evaluated for antimicrobial activity against common food borne pathogens.

EXPERIMENTAL SECTION

a. Collection of plant material

The plant material was collected from different localities in and around Hyderabad. The samples were washed thoroughly to remove dirt particles present on the surface, dried in oven and later crushed into powder form by mortar and pestle. The roots of *Withania somnifera* and leaves of *Aloe Vera* were used in this study.

b. Preparation of extracts

Twenty five grams of the plant material was soaked in 100 ml of each of methanol and water and allowed to stand for 72 h followed by filtration. The extracts obtained by filtration were kept in water bath at 60°C (methanolic extract) and 80°C (aqueous extract) till evaporation of the solvents. The crude extracts left after evaporation were scratched against the walls of the beaker and were weighed, after which they were dissolved in DMSO (dimethyl sulphoxide) according to the standard of 1ml DMSO/mg of extract. The extracts were then collected in centrifuge tubes and were stored at 4ºC in a refrigerator [4, 5].

c. Procurement and maintenance of test pathogens

The various human pathogenic microorganisms used in the study were presented in Table 1.

The pathogenic microorganisms are sub cultured 3 times at 37^0C for 24 h before the usage and 1ml of culture inoculated into nutrient broth and incubated at 37^0C for 24 h. Overnight cultures were used to test the antibacterial activity of plant extracts by using well diffusion method

Table 1. List of pathogenic microorganisms used in the present study

S. No	Name of the Pathogenic microorganism	Source of culture
1	*Staphylococcus aureus*	Microbial type culture collection center (MTCC, Chandigarh)
2	*Bacillus cereus*	Microbial type culture collection center (MTCC, Chandigarh)
3	*Pseudomonas aeroginosa*	Microbial type culture collection center (MTCC, Chandigarh)
4	*Salmonella typhimurium*	National Salmonella Centre (Veterinary), I.V.R.I, Izathnagar.
5	*Escherichia coli*	American type culture collection center (ATCC, USA)
6	*Klebsialla pneumoniae*	Department of Veterinary Public Health, C.V.Sc, Rajendranagar

Antibacterial activity

The antibacterial activity of different extracts of the various parts of the plant was studied by agar well diffusion method [6].

Phytochemical screening

The phytochemical screening of different solvent extracts was performed by using standard method described by [7].

RESULTS AND DISCUSSION

The results of antimicrobial activity of methanolic and aqueous extracts of *Withania somnifera* and *Aloe Vera* were tested against food borne pathogens using Well diffusion method are presented in Table 2 and Fig1 and 2. The present study revealed that the plant extract of *Withania somnifera* showed good antibacterial activity against food borne microorganisms. Methanol extracts of plant were exhibited potent antibacterial activity when compared to the aqueous extracts, which are similar to the findings of [6] though contradicated with the findings of [8], who reported that the antibacterial activity of aqueous extract of *Withania somnifera* on the tested pathogen is more effective than the methanolic extract. *Withania somnifera* plant extract showed more inhibitory activity on gram positive organisms (*Staphylococcus aureus* and *Bacillus cereus*) when compared to gram negative microorganisms, which is in accordance with the findings of [6]. Phytochemical screening of methanolic extract of *Withania somnifera* showed various bioactive compounds such as tannins', glycosides, steroids and flavonoids.

The extracts of *Aloe Vera* showed good antibacterial activity against the all the tested pathogenic micro organisms except *Staphylococcus aureus* and *Pseudomonas aeroginosa.* Methanolic extracts showed greater zone of inhibition when compared to aqueous plant extracts.

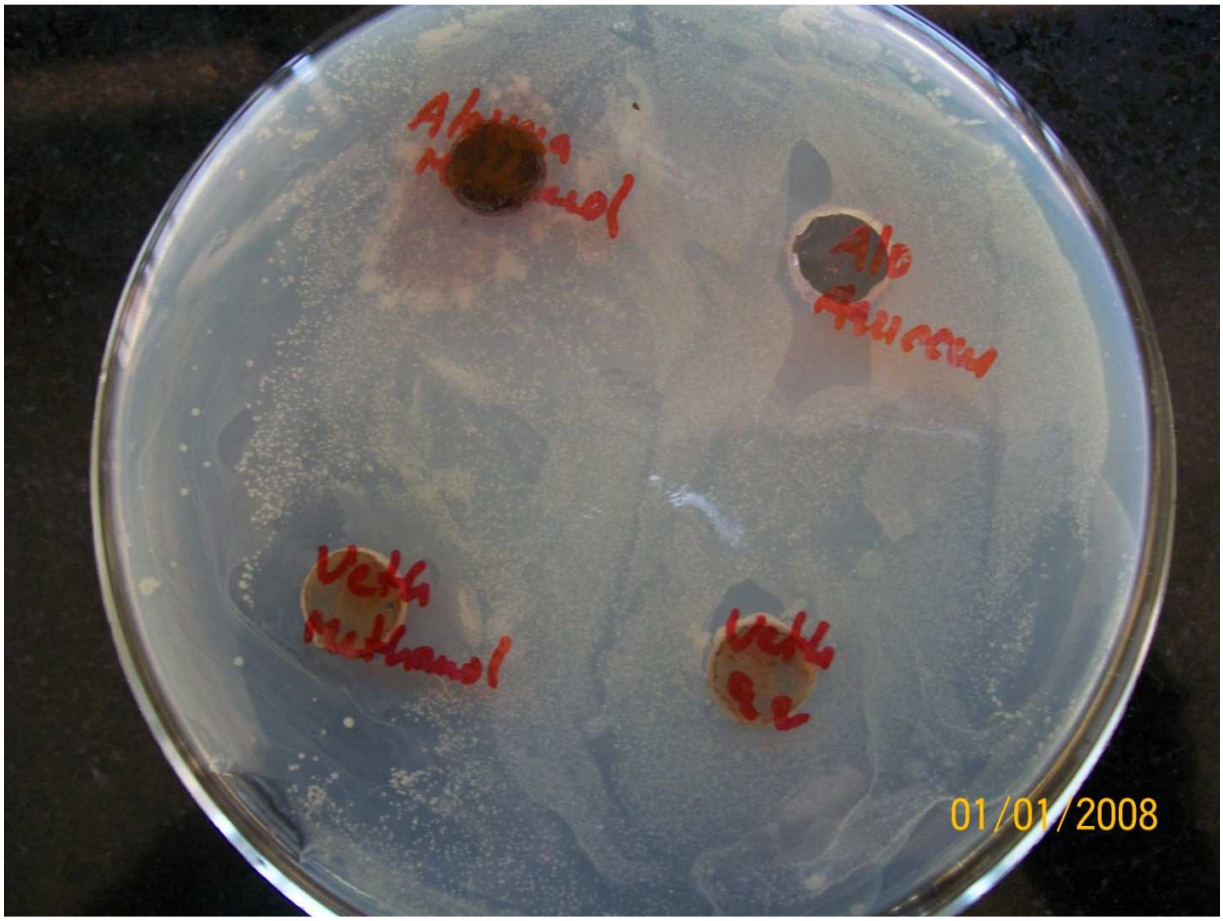

Fig 1: Zone of inhibition of plant extracts (*W. somnifera* and *Aloe vera* methanol and aqueous extracts) against *E.coli.*

The zone of inhibition was more on *Klebsiella pneumonia* and ranged from 7-14 mm, which is in accordance with [9]. Phytochemical screening of methanolic extract of *Aloe Vera* showed various bioactive compounds such as glycosides, steroids and saponins.

In this study, the significant antibacterial activity due to the extracts of *W.somnifera* and *Aloe vera* may be attributed to the bioactive principles namely flavonoids present in the plants.

Table 2: Antibacterial activity of different solvent extracts from *Withania somnifera* and *Aloe Vera* against food borne pathogens (zone of inhibition in mm)

Name of the pathogenic organisms	*Withania somnifera* (root)		*Aloe Vera* (leaf)	
	Methanol extract	Aqueous extract	Methanol extract	Aqueous extract
Escheria coli	16	5	10	2
Salmonella typhimurium	18	12	4	2
Staphylococcus aureus	24	12	-ve	-ve
Pseudomonas aeroginosa	20	13	-ve	-ve
Klebsiella pneumonea	13	10	14	7
Bacillus cereus	17	6	12	6

Note: -ve means no zone of inhibition

Fig 2: Zone of inhibition of plant extracts (*W.somnifera* and *Aloe vera* methanol and aqueous extracts) against *B.cereus*.

CONCLUSION

The present study indicated that the aqueous and methanolic extracts of *Withania somnifera and Aloe Vera* showed good antibacterial activity, though the former revealed better activity. These extracts may be used in the treatment of several infectious diseases caused by the organisms in test.

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