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Amorphophallus species as potential source of antimicrobial agent

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Abstract
Medicinal plants are the mirror image of wealthy India. Medicinal plants are the great source of various natural compounds that have important medicinal values and can be used for the well being of human welfare and for the safety of environment. Amorphophallus species related to the Arid Zone of India. Arid zone plants have specific antifungal, antibacterial and Anti- inflammatory activity because of the some specific bioactive compounds, that makes these plants adaptable to be growing in the desert environment. The present study was performed to screen the antimicrobial ability of Amorphophallus species against selected test microbes using its methanolic and petroleum ether extract. Petroleum ether extract and methanolic extract both shows appreciable antimicrobial activity against test microbes. Petroleum ether shows maximum activity against S. sonnei (10mg/disc, IZ=15, AI= 0.46) and K. pneumonia (10mg/disc, IZ= 14, AI= 0.35) and minimum activity against T. rubrum and negative against C. albicans. The result of methanolic extract activity was excellent. The activity was maximum against P. aeruginosa (5mg/disc, IZ= 20, AI= 1.42) and low against Klebsiella pneumonia.

Keywords: Amorphophallus species, Antimicrobial Activity, Arid zone plants, Bioactive compounds.

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INTRODUCTION

From ancient era, plants have been a rich source of effective and safe medicines. Herbal medicines are the main source of primary healthcare in many nations. Traditional system of medicine has given rise to some important drugs. Humans have long implicit the medicinal properties of plants and have imbued trees, plants and flowers with spiritual properties. Ayurveda describes specific plant, alone or in combination as "rasayana" (nourishing the essence of life). Each herb embodies energy/vibrations that match an energy/vibration in the human body. Nature uses the same materials when creating plants, minerals, mantras and human bodies.

There has been a growing body of evidence and research, which validates the efficacy and safety of employing traditional knowledge based approaches to health and healing. This comes as no surprise, since traditional medicine has been progressively improving its experiential knowledge-base over the centuries and has well proven its worth. Indeed, recent scientific discoveries about the richness and complicated design of the human mind-body complex represent an affirmation of the underlying holistic philosophy of Traditional Medicine.[1]

Plant Secondary Metabolites

The sum of all of the chemical reactions that take place in an organism is called metabolism. Most of that carbon, nitrogen, and energy ends up in molecules that are common to all cells and are required for the proper functioning of cells and organisms. These molecules, e.g., lipids, proteins, nucleic acids, and carbohydrates, are called primary metabolites**.** Most plants divert a significant proportion of assimilated carbon and energy to the synthesis of organic molecules that may have no obvious role in normal cell function. These molecules are known as secondary metabolites.

A common role of secondary metabolites in plants is defense mechanisms. They fight off herbivores, pests, and pathogens. Although researchers know that this trait is common in many plants it is still difficult to determine the precise role each secondary metabolite plays. Some of the roles secondary metabolites play are toxicity or acting as precursors to physical defense systems. These secondary metabolites have different antimicrobial properties and make the plants medicinally important. [2]

Therefore, in the present study attempts were made to screen antimicrobial efficacy of *Amorphophallus species* by using its petroleum ether extract and methanolic extract against selected test microbes.

Medicinal Properties of Amorphallus

Hindi Name	:	Jamikand
Sanskrit Name	:	Suran
English Name	:	Elephant yam
Latin Name	:	Amorphophallus campanulatus Pennel

There are many species of *Amorphallus* and nearly all of them are used as a source of the unique starch contained in the roots.

Distribution

Largely cultivated throughout the plains of India, Ceylon, Malaya to Polynesia. In Ceylon, it is found commonly in the moist low-country to 2000 feet altitude especially near the coast.

Composition

The analysis of the corm has been reported: Moisture, 74.8%; ash, 0.73%; fat (ether extract), 0.38%; protein 5.1%; carbohydrates 18.4%; crude fibre 0.6%. [3] The tuber contains an alkaloid, fat, protein and carbohydrates. [4]

Fresh plant contains 78.0% moisture: and the completely dried material contains ether extract 0.5%, albuminoids 12.2% (containing nitrogen 1.9%); soluble carbohydrates 76.3%, woody fibre 4.0%, and Ash 7.0% (containing sand 0.2%) respectively. Tubers contain an acrid juice. [5]

Antimicrobial activity: The modes of action by which antimicrobial peptides kill bacteria is varied and includes disrupting membranes, interfering with metabolism, and targeting cytoplasmic components.. In general the antimicrobial activity of these peptides is determined by measuring the minimal inhibitory concentration (MIC), which is the lowest concentration of drug that reduces growth by more than 50%.

MATERIALS AND METHODS

Collection:

Authentic samples: Market sample of *Amorphophallus* species were procured from Chunnilal Attar Ayurvedic Store, Ghat Gate, Jaipur.

Processing of plant materials:

During the course of the study each sample was screened for its foreign matter and milled, before use.

Sources of test organisms

Bacteria–Pure culture of all test organisms, namely *Proteus vulgaris, Klebsiella pneumonia, Shigella sonnei, Staphylococcus aureus, Pseudomonas, Trichophyton rubrum, Escherichia coli* were obtained through the courtesy of Mahatma Gandhi Institute of applied Sciences(MGiaS), Jaipur, which were maintained on Nutrient broth media.

Culture of test microbes

For the cultivation of bacteria, Nutrient Agar Medium (NAM) was prepared by using 20 gm Agar, 5 gm Peptone, 3 gm beef extract and 3 gm NaCl in 1 litre distilled water and sterilized at 15 lbs pressure and 121°C temperature for 25-30 minutes. Agar test plates were prepared by pouring approximately 15 ml of NAM into the Petri dishes (10 mm) under aseptic conditions. A saline solution was prepared (by mixing 0.8 % NaCl) in distilled water, followed by autoclaving and the

bacterial cultures were maintained on this medium by regular sub-culturing and incubation at 37°C for 24-48 hours.

To prepare the test plates, in bacteria, 10-15 ml of the respective medium was poured into the Petri plates and used for screening. For assessing the bactericidal efficacy, a fresh suspension of the test bacteria was prepared in saline solution from a freshly grown Agar slant. [6]

Preparation of test extracts

Crushed powder of plant sample was sox let extracted with petroleum ether and methanol. Later, each of the homogenates was filtered and the residue was re-extracted twice for complete exhaustion, the extracts were pooled individually. Each filtrate was concentrated to dryness in vitro and stored at 4°C in a refrigerator, until screened for antibacterial activity.[7,8] The inhibition zone (IZ) in each case were recorded and the activity index (AI) was calculated as compared with those of their respective standard reference drugs (AI = Inhibition Zone of test sample / Inhibition zone of standard).

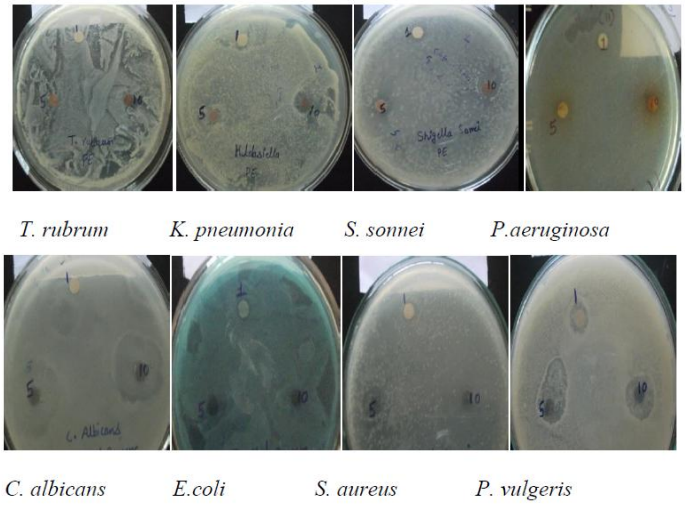
RESULTS AND DISCUSSIONS

Antimicrobial activity of Amorphophallus Petroleum ether Extract: when antimicrobial activity was performed against test microbes through the preparation of petroleum ether extract of plant & disc of 1mg/ml, 5mg/ml and 10mg/ml was prepared. The result activity was appreciable. The activity was maximum against *S. sonnei* (10mg, IZ 0.46) and minimum against *T. rubrum* and negative against *C. albicans*.

		Inhibition zone					
		(A)1mg/disc		(B)5mg/disc		(C)10mg/disc	
Microorganisms	**IZ of standard**	**IZ**	**AI**	**IZ**	**AI**	**IZ**	**AI**
E.coli	(A)20,(B)22,(C)28	0	0	0	0	10	0.35
S. aureus	(A)22, (B)22,(C)27	10	0.45	10	0.45	10	0.37
C. albicans	(A)28, (B)35,(C)37	0	0	0	0	0	0
P. vulgeris	(A)31, (B)38, (C)44	7	0.22	8	0.21	10	0.22
T. rubrum	(A)18,(B)20, (C)22	6	0.33	6	0.3	10	0.45
K. pneumonia	(A)34, (B)36, (C)40	9	0.26	7	0.19	14	0.35
S. sonnei	(A)28,(B)30, (C)32	10	0.35	10	0.33	15	0.46
P.aeruginosa	(A)11,(B)14, (C)15	7	0.63	10	0.71	12	0.8

IZ = Inhibition zone of microorganism, AI= Activity index, AI= IZ of successive/IZ of standard

Table 1: Antimicrobial activity of Amorphophallus Petroleum ether Extract



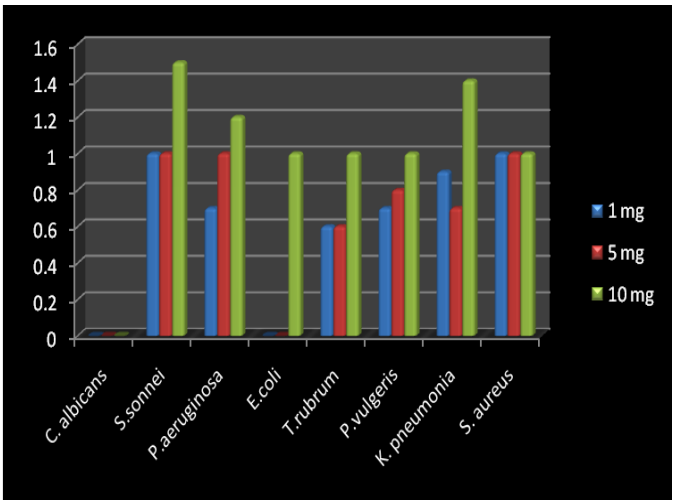


Fig 1: Antimicrobial activity of Amorphophallus Petroleum ether Extract

Petroleum Ether Extract

Antimicrobial activity of Amorphophallus Methanolic extract: antimicrobial activity was performed against test microbes through the preparation of Methanol extract of plant & disc of 1mg/ml, 5mg/ml and 10mg/ml was prepared. The result of Methanolic extract was excellent. The activity was maximum against *P. aeruginosa* (5mg, IZ 1.42) and low against *Klebsiella sps*.

		Inhibition zone					
		(A)1mg/disc		(B)5mg/disc		(C)10mg/disc	
Microorganisms	**IZ of standard**	**IZ**	**AI**	**IZ**	**AI**	**IZ**	**AI**
E.coli	(A)20,(B)22,(C)28	22	1.1	21	0.95	18	0.64
S. aureus	(A)22, (B)22,(C)27	23	1	23	1	24	0.88
C. albicans	(A)28, (B)35,(C)37	20	0.71	20	0.57	22	0.59
P. vulgeris	(A)31, (B)38, (C)44	24	0.77	21	0.55	25	0.56
T. rubrum	(A)18,(B)20,(C)22	25	1.3	23	1.15	26	1.18
K. pneumonia	(A)34, (B)36, (C)40	18	0.52	19	0.52	10	0.25
S. sonnei	(A)28,(B)30,(C)32	19	0.67	23	0.1	20	0.62
P.aeruginosa	(A)11,(B)14,(C)15	19	1.7	20	1.42	20	1.33

Table 2: Antimicrobial activity of Amorphophallus Methanolic Extract

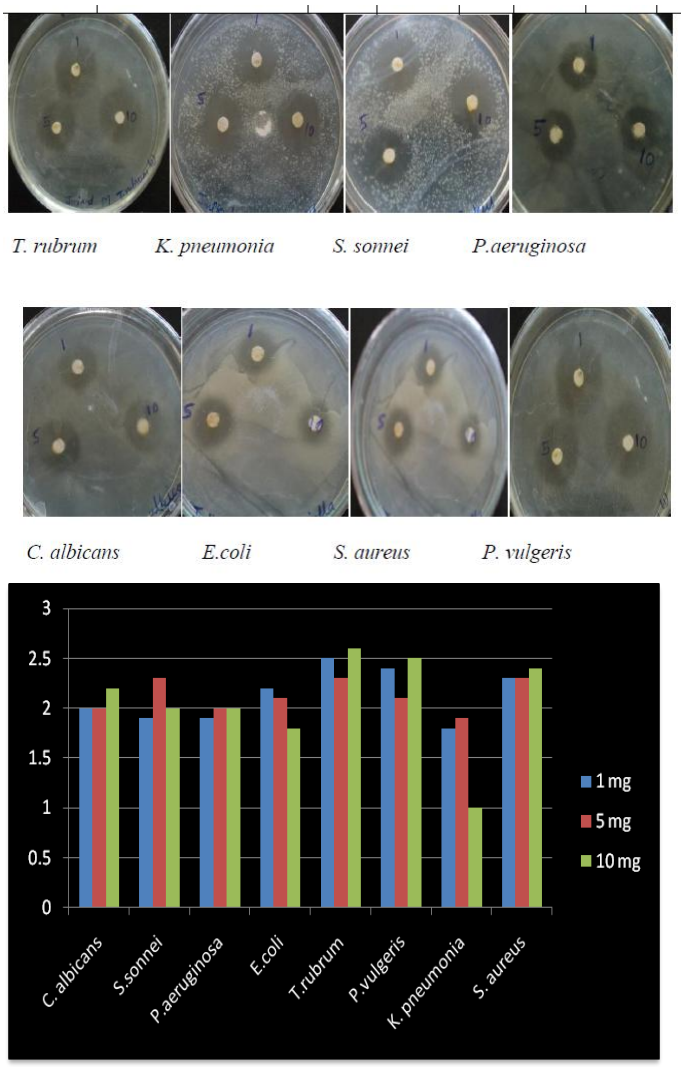


Fig 2: Antimicrobial activity of Amorphophallus Methanolic Extract

CONCLUSION

The present study was performed to screen the antimicrobial ability of *Amorphophallus* species against selected test microbes using its methanolic and petroleum ether extract. Petroleum ether extract and methanolic extract both shows appreciable antimicrobial activity against test microbes. Petroleum ether shows maximum activity against *S. sonnei* (10mg/disc, IZ=15, AI= 0.46) and *K. pneumonia* (10mg/disc, IZ= 14, AI= 0.35) and minimum activity against *T. rubrum* and negative against *C. albicans*. The result of methanolic extract activity was excellent. The activity was maximum against *P. aeruginosa* (5mg/disc, IZ= 20, AI= 1.42) and low against *Klebsiella pneumonia*. Hence, in present investigation, attempts were made to create new magnitude for the use of Amorphophallus as a potential source of antimicrobial agents.

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