



**PHYTOCHEMICAL SCREENING AND ANTIBACTERIAL
EFFICACY OF *ALLIUM PORRUM* EXTRACTS**

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ABSTRACT

Phytochemical constituents of *Allium porrum* leaf extracts and its antibacterial potentialities were evaluated using different solvents. Phytochemical screening of the different extracts showed that leaves contains important compounds such as amino acid with sulphate, carbohydrates, Phenols, Proteins, flavonoids, alkaloids, steroids, Tannins and saponin. Aqueous, methanol and acetone extracts of plant leaves were used for assessing antibacterial activity against *Salmonella typhi*, *Klebsiella pneumonia*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Proteus vulgaris* by agar well diffusion method. The present study demonstrated that the aqueous, methanolic, acetone extracts of *A. porrum* consists different phytochemical components thus exhibit variations in the antibacterial activity. These promissory extracts open the prospect of finding new clinically effective antibacterial compounds.

KEY WORDS: *Allium porrum*, Aqueous extract, Phytochemical, Antibacterial.



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INTRODUCTION

Allium is the leading and the most important delegate genus of the Alliaceae family. *Allium porrum*, commonly known as leek is an annual herbaceous biennial plant. It is closely associated to onion. The leaves and long white bunched stem are eaten cooked or added to salads¹. It contains tremendous amounts of vitamin C, as well as folate and some amounts of the vitamins B and E, copper, potassium and iron². For many centuries, several *Allium* species have been used as vegetables and spices, and as folk medicines for curing various diseases such as stomach ulcer, sores, wounds, tuberculosis, reduced blood pressure and anti-helminthic^{3,4}. It is also known that the leek contains substances that act as natural antibiotics⁵. The use of plant extract for medicinal treatment has become popular when people realized that the effective life span of antibiotic is limited and over prescription and misuse of traditional antibiotics are causing microbial resistance⁶. At present, nearly 30% or more of the modern pharmacological drugs are derived directly or indirectly from plants and their extracts dominate in homeopathic or ayurvedic medicines^{7,8,9}. Infectious diseases are the leading cause of death world-wide. Antibiotic resistance has become a leading global concern¹⁰. The clinical efficacy of many existing antibiotics are being threatened by the emergence of multidrug-resistant pathogens¹¹. Many infectious diseases have been known to be treated with herbal remedies throughout the history of mankind. Natural products, either as pure compounds or as standardized plant extracts, provide unrestricted opportunities for new drug leads because of the unmatched availability of chemical diversity. In most of the countries, traditional medicine is widely used to treat many of these common ailments. Hence, the present study has planned to analyse the phytochemical constituents and antimicrobial efficiency of the plant *A. porrum* extract against some human pathogenic bacteria.

MATERIALS AND METHODOLOGY

Plant Material

The leaves of *Allium porrum* were purchased from the city of Ooty, Tamil Nadu, India. The taxonomic identities of these plants were confirmed by Domestication of Plants in the Old World¹².

Phytochemical analysis

Phytochemical analysis of aqueous, methanol and acetone extracts of the plants were done by using the standard method¹³. The presence or absence of active phytochemical constituents such as tannins, alkaloids, flavanoids, steroids, carbohydrates, proteins and saponins, amino acid with sulphate were qualitatively analyzed.

Preparation of Extracts

The collected fresh leaves were washed thoroughly for 2-3 times with running water; about 10g of fresh leaves were grained using water, acetone and methanol. The finely grounded paste was soaked in 20ml of 70% methanol and 70% acetone separately and was wrapped to prevent the evaporation of volatile compound. The different solvent extracts were kept in a rotary shaker for 72 h. The resultant extracts were centrifuged at 5000rpm for 10 min and the supernatant was collected and stored at -20°C and to assess the antimicrobial activity of test organisms.

Test organisms

Authentic cultures of human pathogenic bacteria viz., *Salmonella typhi*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Proteus vulgaris* were obtained from Microbial Type Culture Collection (MTCC) The Institute of Microbial Technology Chandigarh, India.

Antibiogram activity

Antibacterial activity of different solvent extracts of the studied plant was determined

by agar well diffusion method on Mueller Hinton agar medium¹⁴. Inoculum containing 10⁶ CFU/ml of bacteria were spread on the solid media with a sterile swab moistened with the bacterial suspension and wells were made in Agar plate with 6mm in diameter. The solvent extracts were reconstituted in methanol and Acetone to a concentration of 100 mg/ml. 100 µl solvent extract of plant was placed in the wells made in the inoculated plates. Also 100 µl of aqueous, methanol and acetone was placed in the wells separately as a control. Standard Antibiotics/drugs namely Gentamycine and Ampicillin were also tested for the comparison of antimicrobial efficacy with medicinal plant extracts. The plates were incubated for 24 h at 37°C and zone of inhibition around the well was measured in millimeter.

RESULTS AND DISCUSSION

Phytochemical analysis showed that the aqueous, methanol, acetone extract of *Allium porrum* has many biological active compound. Among them, methanolic extract showed maximum phytochemical constituents includes free amino acids, amino acids that contain sulphate, proteins, saponins, alkaloids, steroids, flavonoids, phenols, tannins, and saponins when compared with other two extracts (Table: 1). Many reports proved that methanol is a highly potent solvent for analyzing the phytochemical compounds of any plant extracts. This is corroborates with the present study. It is known that Alliaceae family contains many sulphate compounds in addition to other chemical compound which is considered being pharmaceutically valuable^{15, 16}.

Table 1
Phytochemical screening of different solvent extracts of *A. porrum*

Phytochemical test	Name of the test	Aqueous Extract	Methanolic Extract	Acetone Extract
Aminoacid +sulphate	NaOH Lead Acetate	+	+	+
Carbohydrate	Molish test	+	+	+
	Benedict's	+	+	+
Alkaloids	Mayer's test	+	+	+
Steroids	Chloroform + Acetic acid+ H ₂ SO ₄	-	+	-
Tannins	Lead Acetate 1%	-	+	-
Phenols	FeCl ₃ 1%	+	+	+
Saponins	Foam test	+	+	+
Flavonoids	NaOH/Hcl	-	+	-
Proteins	Biuret test	-	+	-

The antibacterial activity of the plant extract have been screened because of their great medicinal relevance with the recent years, infections have increased to a great extent and resistant against antibiotics, becomes an ever increasing therapeutic problem^{17,18,19}. The present investigation was to evaluate the antimicrobial efficacy of aqueous, methanol and acetone extract of *Allium porrum* against five different

human pathogenic bacterial species. The antimicrobial efficacy of crude extract was compared with standard antibiotics such as Gentamicine and Ampicillin which considered to popular in treatment of diseases against those five bacterial species, the effect of different solvent extract reached to that of antibiotics at concentration 100 µg/ml.

Table 2
Antibacterial efficacy of different extract of *A. porrum* against pathogenic bacteria

Name of the organisms	Zone of Inhibition (Diameter in mm)				
	Aqueous	Methanol	Acetone	Ampicillin	Gentamicin
<i>Salmonella typhi</i>	23	34	29	30	29
<i>Staphylococcus aureus</i>	12	28	13	22	23
<i>Klebsiella pneumoniae</i>	14	19	28	20	22
<i>Pseudomonas aeruginosa</i>	10	27	10	25	26
<i>Proteus vulgaris</i>	15	16	26	25	24

The methanolic extract of *A. porrum* showed highest activity against *Salmonella typhi*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*, the inhibition zone was measured as 34, 28, 27 mm respectively. The acetone extract of the plant produced zone of inhibition like 29, 28, 26 mm against *Salmonella typhi*, *Klebsiella pneumoniae* and *Proteus vulgaris* respectively but, the aqueous extract was showed minimum activity against the pathogens (Table:2). The obtained zone of inhibition indicates that *A. porrum* leaves exhibited *in vitro* antibacterial activity against Gram-positive and Gram-negative bacteria. All the bacterial pathogens established some degree of sensitivity to the plant. Among the extracts, the methanolic extract showed a higher anti-bacterial activity followed by acetone and aqueous extract of the leaves. These results were similarly obtained with previous studies also²⁰. The present investigation highlights that the extracts obtained from different organic solvent have various degree of antibacterial activity.

CONCLUSION

On the basis of the present investigation, it turns out that *Allium porrum* extracts was revealed that interesting antibacterial properties might be due to their more phytochemical composition. The obtained results sustain the use of these plants in traditional medicine. The potential for developing antimicrobials from plants appears worthwhile as it leads to the development of new drugs which is needed today. Further research is necessary to separate the active compounds from this plant with their full spectrum of efficacy. However, the present study of *in vitro* antibacterial activity of *A. porrum* forms primary platform for further pharmacological studies. It concluded that, *A. porrum* extract hold a broad spectrum of activity against a panel of bacteria responsible for the most common bacterial diseases.

CONFLICT OF INTEREST

We declared that there is no conflict of interest.

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