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Research Article

ANTIMICROBIAL ACTIVITY OF *EICHHORNIA CRASSIPES* AGAINST MDR CLINICAL PATHOGENS

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ABSTRACT

Eichhornia crassipes (Mart) solms., ordinarily known as water hyacinth is warm water aquatic plant and the world's worst aquatic weed as it can grown quickly thereby closing water bodies and negatively affects the water bodies. It is one of the main problem to the water reservoir, Morna river of Akola city, but looking towards it's medicinal value, supreme interest has been received to determine its antimicrobial potential against Multi Drug Resistant (MDR) bacteria. In this view the aqueous, aqueous and ethanol extracts of leaf and flower of water hyacinth were prepared and tested against the resistant bacteria by agar well diffusion method. A significant activity was noted by Distilled water extract against most of the isolates.

INTRODUCTION

For centuries, plants have been used as a source of medicines. Plants are positive source of antimicrobial agent (Shelke and Chavan 2016). Traditional medicine using plant extracts still continues to provide health services for over 80% of world's population, especially in the developing countries. Plant extracts have great potential as biologically active compounds against pathogens, including microorganisms (Fischer *et.al*.2004). . Also, the synergistic effect from the association of antibiotics in plant extracts against resistant bacteria leads to new choices for treatment of infectious diseases which enables the plant as a potential candidate for drug development. In recent years, novel active compounds have been discovered from variety of plant species based on the study of traditional medicines.

Plants secondary metabolites have beneficial medicinal effects on human due to their interaction with potential target sites. This is due to the fact that they constitute a wide range of novel chemical compound which are of potential use in medicine. It contain a variety of active compounds such as alkaloids, steroids, tannins, glycosides, volatile oils, fixed oils, resins ,phenols and flavonoids that are deposited in specific parts such as leaves, flowers, bark, seeds, fruits, root, etc (Gadekar *et al.*, 2010). The beneficial medicinal effects of plant materials typically results from the combination of these secondary products (Wink, 1999).

Eichhornia crassipes (Mart.) solms commonly known as water hyacinth is a warm water aquatic plant belonging to the family *Pontideriaceae*. It is native to Brazil. Plants are thought to have been first introduced into the United States at the 1884 Cotton States Exposition in New Orleans, LA. Water hyacinth is a floating, flowering, perennial weed, form dense rafts in the water and mud (Mane *et.al.* 2011). Its habitat ranges from tropical desert to subtropical or warm temperature desert to rainforest zones. lt tolerates annual temperature ranging from 21.1°C to 27.2°C and its pH tolerance is estimated at 5.0 to 7.5.Coupled with near stable nature of the tropical environment, the plant is euryhallne, tolerating both fresh & marine water; hence its spread knows no boundaries(Lata and Dubey 2010). It can quickly grow to very high densities; thereby completely clogging water bodies, which in turn may have negative effects on the environment, human health and economic development (Jayanthi *e .al,.* 2011).

Water hyacinth is a source of chemicals with medicinal function. The leaf extract of this plant contains flavonoids, alkaloids, tannins, phenols, which have biological activities such as antiviral, antifungal antitumor and antibacterial agent. In addition, Water hyacinth has rich oxidative enzyme and

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nonenzymatic antioxidant. There have been studies on the use of plant products as disease control agents, with less toxicity and fewer environmental effects (Haggag *et al.,* 2016).

Attention has been drawn to the antimicrobial activity of plant and their metabolism due to the challenge of growing incidences of drug- resistant pathogens (Baral and Vaidya 2011). Water hyacinth, fast growing perennial aquatic macrophyte (Reddy and Sutton, 1984). Locally called 'Jalkumbhi', is one of the world's most obnoxious waterweeds when not controlled. It is listed as one of the most productive plant on earth and is considered the world's worst aquatic weed. Recently, considerable attention has been given to harvesting this aquatic plant for practical uses to partially defray the cost of removing plants form waterways and use as economical sources in many parts of world (Lata and Dubey, 2010). Though very less pharmacological study and biological activity of this plant has been reported (Baral and Vaidya, 2011). Thus, the present study was undertaken to evaluate the antimicrobial activity of the water hyacinth against some clinical pathogens.

MATERIAL AND METHODS

Collection of plant material

The plants were randomly selected from the different parts of Morna River in Akola city. The plant material like stem and leaves were washed twice with the running tap water and with the distilled water respectively. The materials were then dried under showed and crushed into fine powder with the help of grinder.

Preparation of plant extract

The plant material like leaves and stem powder was weighed and soaked in 100 ml of different solvents like Acetone , Ethanol and distilled water about 10gm of powder of plant material was added in 100ml of respective solvent and kept at Rotatory shaker. After 24 hrs of soaking the extract were collected by filtering through Whatmann Filter Paper no 1. The extract were evaporated and stored in a refrigerator for future use.

Collection of Test oraganism

The bacterial isolates used in the present study were Escherichia *coli, Staphylococcus aureus, Bacillus Spp, Pseudomonas aeruginosa* and *Klebsiella pneumoniae*. This bacterial strains used were obtained from Department of Microbiology Shri Shivaji collage Akola. From the previous studies on Antibiotic Susceptibility pattern.

Determination of Antibacterial activity of the different plant extract

The different plant extracts were prepared and tested for their activity against five bacterial species. The antibacterial activity was studied using agar well diffusion method and the diameter of zone of inhibitions was measured. For this firstly bacterial isolates were grown in Nutrient Broth for 18-24 hrs before use with the sterile swab the each culture was transferred to the sterile cork borer .A well of 5mm diameter was made in the agar plate. After preparation of bacterial lawn on surface of Petri dish the different concentration of different extracts of plant material was added to the wells. The plates were then incubated for 24hrs at 37^0 C. After incubation the diameter of the clear inhibition zone surrounding the well were measured.

RESULT AND DISCUSSION

In present study the Tetracycline was used as standard antibiotic which showed antimicrobial activity against selected pathogens. Tetracycline showed highest zone of inhibition i.e 16mm against *Klebsiella pneumoniae*, followed by *Bacillus subtilis* which showed highest zone i.e. 13mm. Whereas 12 mm zone of inhibition showed against *Escherichia coli* and 10mm zone showed against *Staphylococcus aureus*. It was observed that *Pseudomonas aeruginosa* showed resistance against standard antibiotic (Table1).

In the present study antimicrobial activity of stem and leaves of *E. crassipes* were studied with the different extracts of ethanol, acetone and distilled water against clinical isolates. In the present investigation results showed that leaves and stem of acetone extract exhibits antimicrobial activity against selected pathogens. In the study different concentration of extracts were taken like 100µg/ml, 75µg/ml, 50µg/ml and 25µg/ml.

The *Escherichia coli* showed highest zone of inhibition for acetone leaves extract at 100µg/ml concentration (25mm) while *Klebsiella pneumoniae* 22mm zone of inhibition followed by *Staphylococcus aureus* for which 21 mm zone of inhibition and *Pseudomonas aeruginosa* showed 15mm zone of inhibition at 100µg/ml another one *Bacillus subtilis* showed 15mm zone of inhibition at 100µg/ml. While stem extract showed same activity against *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Klebsiella pneumioniae* i.e. 20mm highest inhibition zone at 100µg/ml. *Escherichia coli* found less sensitive to exact i.e. 19mm zone was observed at 100µg/ml similarly least activity recorded by *Bacillus subtilis* which showed 16mm zone found at 100µ/ml(Fig. 1&2).

The antimicrobial activity of Ethanol extract of leaves was also studied (Fig 3&4)). *Escherichia coli* showed highest zone of inhibition at 100µg/ml which was 25mm. For another pathogen *Pseudomonas aeruginosa* found 17mm zone of inhibition also at 100µg/ml. *Staphylococcus aureus* found resistance at 100µg/ml. while 20mm zone observed against *Klebsiella pneumonia* and for *Bacillus subtilis* found a 17mm zone of inhibition at 100µg/ml. Similarly the activity of stem showed 20mm highest zone of inhibition at 100µg/ml against *Escherichia coli* and *Klebsiella pnumoniae*. Followed by *Pseudomonas aeruginosa* for which 17mm zone of inhibition at 100µg/ml. For *Staphylococcus aureus* and *Bacillus subtilis* similar zone of inhibition was found i.e. 15mm at 100µg/ml concentration.

Klebsiella pnumoniae showed highest zone of inhibition for Aqueous extract i.e 22mm at 100µg/ml for leaf. Followed by *Escherichia coli* showed 21mm zone of inhibition at same concentration while 20mm zone was observed against *Pseudomonas aureuginosa* and *Bacillus subtilis*. Also at the same concentration *Staphylococus aureus* showed 17mm zone of inhibition. In the study of aqueous stem extract highest zone of inhibition i.e. 30mm at 100µg/ml recorded against *Pseudomonas aeruginosa* comparatively found that standard antibiotic was fail to inhibit the grown but extract it was showed good antimicrobial activity against *Pseudomonas aeruginosa*. Whereas *Escherichia coli* and *Staphylococus*

aureus showed similar zone of inhibition i.e. 15mm The *Klebsilla pnumoniae* showed a 14mm zone of inhibition at 100µg/ml while *Bacillus subtilis* showed 12mm zone of inhibition at same concentration(Fig 5&6).

Table No. 1 Zone of inhibition shown by standard antibiotics against clinical pathogens

Isolates	Zone of inhibition in mm
	Tetracycline(10µg/ml)
Escherichia coli	12
Pseudomonas aeruginosa	-
Staphylococcus aureus	10
Klebsiella pneumoniae	16
Bacillus subtilis	13

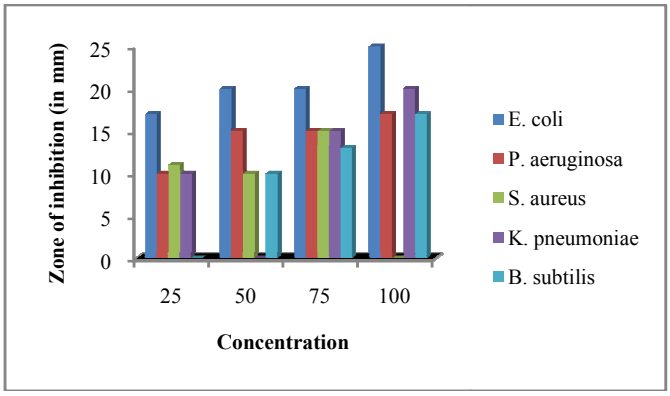

Fig 1 Antimicrobial activity of acetone extract of leaf against clinical pathogens

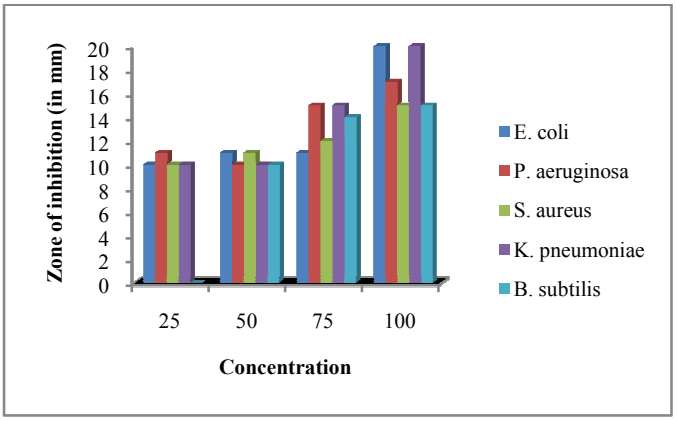

Fig 2 Antimicrobial activity of acetone extract of stem against clinical pathogens

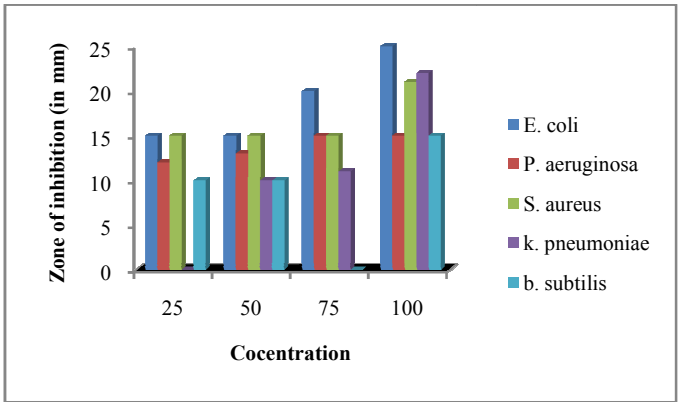

Fig 3 Antimicrobial activity of ethanol extract of leaf against clinical pathogens

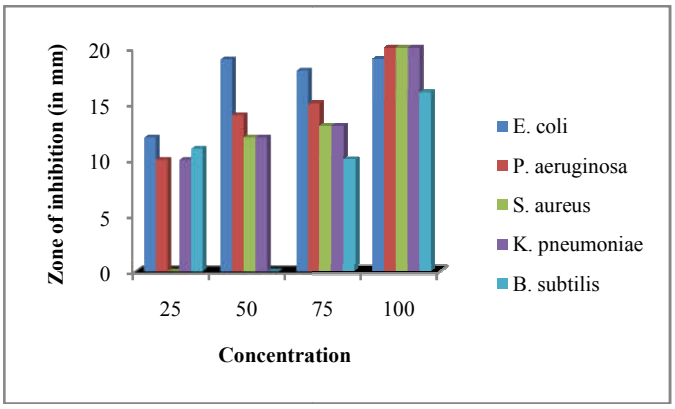

Fig 4 Antimicrobial activity of ethanol extract of stem against clinical pathogens

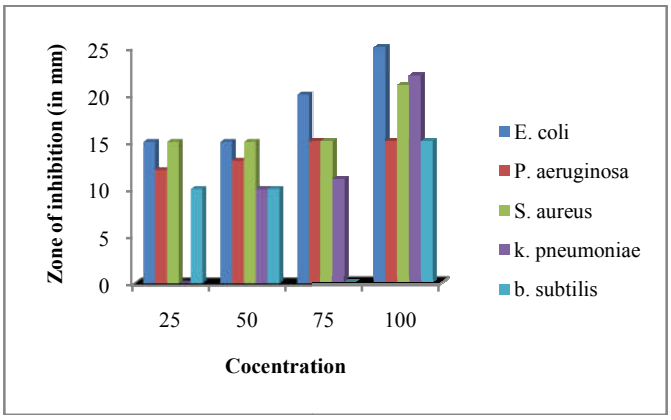

Fig 5 Antimicrobial activity of aqueous extract of leaf against clinical pathogens

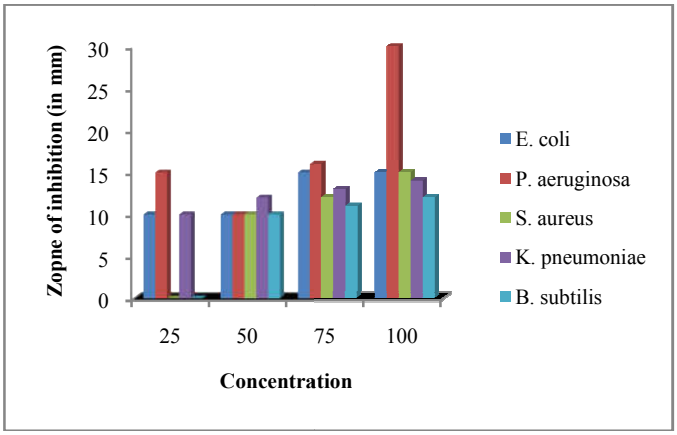

Fig 6 Antimicrobial activity of aqueous extract of stem against clinical pathogens

DISCUSSION

In our study Antimicrobial activity of *Eichhornia crassipes* from Acetone, Ethanol, Aqueous extracts showed good activity against bacterial strains. These results are in accordance by other authors Jayanthi and Lalitha, (2011). In that study the acetone extract of water hyacinth exhibited higher activity against all the test organisms tested.

The Haggag *et al.,* (2016) reveled less antimicrobial activity compared with our result. The *E. coli* showed highest zone of inhibition against acetone extract i.e. 25mm compared to this author the result was found against acetone is less than that of our results, it showed 8.3mm zone of inhibition against

pathogenic bacteria. While *Bacillus subtilis* showed maximum activity that of above results, the zone of inhibition recorded 15mm from acetone and this author showed 10.4 mm zone of inhibition against same extract. Another one Ethanol extract showed maximum good activity in our study, inhibition against same bacteria which was less than that of our result.

Similar works were done by Thamaraiselvi *et al.,* (2012) who demonstrated that leaf extracts of *E. crassipes* showed considerable antibacterial activity. In another study Kayathri *et al.,* (2015) reported antibacterial activity of *E. crassipes* showed considerable activity it showed less activity than that of our results. In this study *Staphylococcus aureus* found resistant against acetone and aqueous which showed similarity.

Joshi and Kaur (2013) exhibited *Pseudomonas aeruginosa* showed resistance against ethanol and aqueous extract ,whereas in our study *Pseudomonas aeruginosa* showed good activity against ethanol extract and aqueous extract i.e. 17mm and 20mm zone of inhibition. While in that study ethanol extract showed maximum zone of inhibition against *Escherichia coli* similarly in our study *E. coli* found maximum zone of inhibition i.e. 25mm.Whereas aqueous extract showed maximum zone of inhibition against *Bacillus subtilis* in similar to present study.

According to Baral and Vaidya (2011) *Klebsiella pneumoniae* showed the highest inhibition zone i.e. 13 mm in aqueous extract with compared to our study found a 22mm inhibition zone in aqueous extract which where in that study *E. coli* showed little less inhibition zone i.e. 11mm where as in our study *E. coli* showed highest inhibition zone i.e. 21mm.

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