

Evaluation of Antimicrobial Activity of Methanol and Ethanol Extracts of Selected Medicinal Plant against Some Harmful Pathogens

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Abstract

Methanol and ethanol extracts of selected medicinal plant *Euphorbia hirta* L. have been evaluated for their antimicrobial effect against some harmful pathogens such as *Escherichia coli* and *Staphylococcus aureus*. Amongst all the extracts tested, methanolic extract of all parts *E. hirta* was comparably more effective to inhibit the growth of microbes than ethanol extracts. In methanol solvent, maximum *in vitro* inhibition was scored in leaf extract against *E. coli* and maximum *in vitro* inhibition was scored in leaf and bud extract against *Staphylococcus aureus*. In ethanol, maximum *in vitro* inhibition was scored in leaf extract with 15 mm against *E. coli* and in leaf and bud extract with 15 mm against *Staphylococcus aureus*. A significant inhibition was also found in other extracts of *Euphorbia hirta* against *E. coli* and *S. aureus*.

KEYWORDS: *Euphorbia hirta* L., Extracts, *E. coli* and *Staphylococcus aureus*

Introduction

There are a treasure of medicinal and aromatic plants in India. A number of herbs are traditionally used for treatment of various diseases. Bioactive compound from natural plants has always been of great interest to scientists working on microbial diseases. In past few years, the active plant extracts are screened to explore the pharmacological activities of medicinal plants (Pretorius *et al.*, 2003, Moreillion *et al.*, 2005, Chah *et al.*, 2006). Infection with microorganism is one of the causes of a number of diseases. Certain causative micro-organisms of bacterial infection are *Staphylococcus aureus* and *Escherichia coli*.

Antimicrobial studies have carried out on some medicinal plants including *Betula pendula* (Mukhtar *et al.*, 2002) and *Ageratum houstonianum* (Bowers, 1976). Several workers have evaluated antimicrobial activity of *Euphorbia hirta* against few microbes (El-Mahmood *et al.*, 2009; Shanmugapriya *et al.*, 2012; Ibrahim *et al.*, 2012).

Selected plant for antimicrobial research work is *Euphorbia hirta* Linn (family - Euphorbiaceae) a perennial herb. It is used in intestinal parasites, diarrhea, peptic ulcers, vomiting, dysentery, asthma, bronchitis, coughs, colds, kidney stones, sterility and venereal diseases. The plant has a reputation as an analgesic to treat severe headache, toothache, rheumatism, colic and pains during pregnancy. It is used as an antidote and pain relief of scorpion stings and snakebites. The latex of the plant is used to cure some wounds. *Euphorbia hirta* is often used traditionally for female disorders, respiratory ailments (cough, coryza, bronchitis, and asthma), worm infestations in children, dysentery, jaundice, pimples, gonorrhea, digestive problems, and tumors. Extracts of *E. hirta* have been found to show anticancer activity.

Test pathogens used in present work were *Escherichia coli* (gram negative bacteria) and *Staphylococcus aureus* (gram positive bacteria). Harmful *E. coli* strains can cause bloody diarrhea. *S. aureus* can cause life threatening diseases such as meningitis, pneumonia, osteomyelitis etc. Both bacteria have been proved to be major

causal organisms of various human infections such as food poisoning, wound infections and urinary tract infections.

The purpose of the present study was to compare the antimicrobial activity of different parts of *E.hirta* using different solvents against disease causing bacteria *Escherichia coli* and *Staphylococcus aureus* .

Material and Methods

Fresh leaf, bud and stem of *Euphorbia hirta* were collected from different regions of Ranchi district of Jharkhand, India. Plant was identified taxonomically and authenticated. Fresh plant materials were washed under running tap water, shade-dried at room temperature. The different parts of the plant were powdered, stored and used for extraction. The plant extracts were prepared by immersing 15 g of dried powder in 150 mL of solvents i.e. methanol and ethanol for 72 hr. Each extract was passed through Whatman No. 1 filter paper. After evaporation, extracts were stored in sterile bottles at 4 °C for further use.

The pathogenic bacteria *Escherichia coli* and *Staphylococcus aureus* were selected for the study on the basis of their clinical pharmaceutical importance. They cause infection and contamination of food and drugs. Bacterial culture were obtained from the Birsa Agriculture University, Kanke, Ranchi, Jharkhand, India. The test bacterial species were maintained on nutrient agar media for further use.

The antimicrobial activity of extracts using different solvent were evaluated by agar disc diffusion method. The disc of 5 mm was saturated with plant extract and pure solvent. All the solvents served as negative control. It was introduced on the upper layer of the seeded agar plate. Then plates were incubated at 37°C for 24 hours. The experiment was carried out in triplication. Microbial growth was determined by measuring the diameter of the zone of inhibition in millimeters (mm).

Results and Discussion

The present study has shown that selected medicinal plant possess antimicrobial properties. Table -1 shows the effect of the different extracts of the plants against the tested pathogens. All the plant extracts showed significant inhibition against *Escherichia coli* and *Staphylococcus aureus* .

Results revealed that methanol and ethanol extracts of different parts of *Euphorbia hirta* L. possess potential antimicrobial activity against tested pathogens. In methanol extract, leaf extract of plant showed maximum *in vitro* inhibition against *E. coli* which offered inhibition zone of 25 mm. Maximum *in vitro* inhibition against *Staphylococcus aureus* was shown by leaf and bud extracts in methanol which recorded same significant zone of inhibition of 20 mm. Further stem extract of *E. hirta* was effective against *S. aureus* and *E. coli* which recorded significant zone of inhibition of 15 mm (Table-1 and Graph – 1).

In ethanol solvent, all the extracts showed significant inhibition against all tested pathogens. Leaf and bud extract in ethanol showed maximum antimicrobial activity against *S. aureus* and *E. coli* which recorded significant zone of inhibition of 15 mm (Table-1 and Graph – 2). but bud extract in ethanol offered 13 mm inhibition zone against *E. coli*. Stem extract in ethanol shows 11 mm and 10mm inhibition zone against *S. aureus* and *E. coli* respectively.

Different parts of selected plant showed greater inhibitory activity in methanol extracts when compared to ethanol extracts. The present study has shown

the aerial parts of plant *E.hirta* in methanol and ethanol solvent posses antimicrobial properties that support its medicinal value. The antimicrobial activity of extracts could be due to presence of some phytoconstituents.

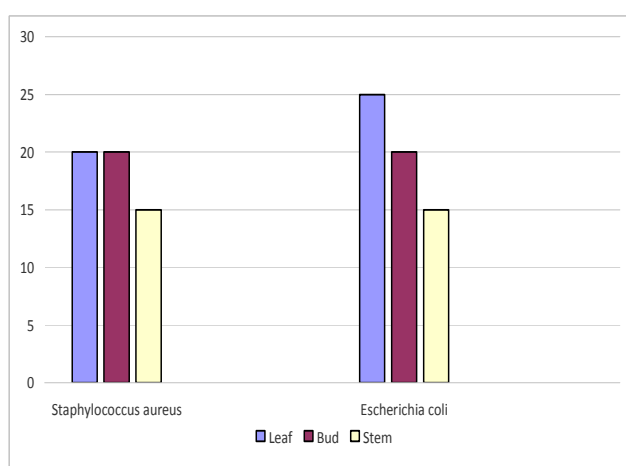
Table 1: Study of Diameter of Zone of Inhibition (DIZ) and Zone of Inhibition Area (ZIA) of **Methanol** and **Ethanol** extracts of different parts of *Euphorbia hirta* against *Staphylococcus aureus* and *Escherichia coli* .

Solvent	Methanol		Ethanol	
	<i>S. aureus</i>	<i>E. coli</i>	<i>S. aureus</i>	<i>E. coli</i>
Bacteria →				
Parts of Plant ↓	DIZ(mm)	DIZ(mm)	DIZ(mm)	DIZ(mm)
Leaf (Lm)	20	25	15	15
Bud (Bm)	20	20	15	13
Stem (Sm)	15	15	11	10

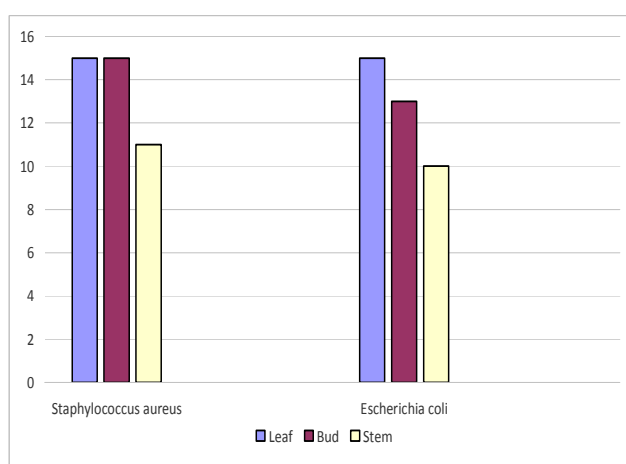
DIZ = Diameter of zone of inhibition in millimeter scale.

ZIA = Zone of Inhibition Area in millimeter square.

Graph 1: Antimicrobial activity of **Methanol** Extracts of different parts of *Euphorbia hirta* against *Staphylococcus aureus* and *Escherichia coli* .



Graph 2: Antimicrobial activity of **Ethanol** Extracts of different parts of *Euphorbia hirta* against *Staphylococcus aureus* and *Escherichia coli* .



Conclusion

As a result, it can be concluded that *E. hirta* extracts using methanol and ethanol solvent were most effective against *Escherichia coli* and *Staphylococcus aureus*. Out of all the extracts from *E. hirta*, maximum significant antimicrobial activity showed by methanol extract. The result of research work have justified the traditional indirect use of plant in curing diseases. Further studies needed the phytochemical analysis of plant extracts by using standard qualitative methods.

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