



COMPARISON BETWEEN ANTIMICROBIAL ACTIVITY OF ETHANOL AND AQUEOUS EXTRACTS OF MEDICINAL PLANT - *EUPHORBIA HIRTA* L. AGAINST SOME PATHOGENS

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ABSTRACT

Effect of ethanol and aqueous extracts of different parts of medicinal plant *Euphorbia hirta* L. were examined using agar disc diffusion method against some pathogens such as *Escherichia coli* and *Staphylococcus aureus*. Leaf, bud and stem were extracted using ethanol and aqueous as solvent. In case of *E. coli*, maximum *in vitro* inhibition was scored in bud extract using aqueous solvent which offered inhibition zone of 20 mm and zone of inhibition area of 471.00 mm². In case of *S. aureus*, both leaf and bud extracts in ethanol and bud and stem extracts in aqueous solvent which offered same inhibition zone of 15 mm and zone of inhibition area of 294.38 mm². A significant inhibition was also found in other extracts of *Euphorbia hirta* against *E. coli* and *S. aureus*.

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INTRODUCTION

Recently the World Health Organization has documented at least twenty thousands medicinal plants used in different parts of the globe. But only about 10,000 plants are used as medicine in India. India is a legendary land of natural medicinal and aromatic plants. Medicinal plants are a rich source of drugs for the treatment of various health disorders. Medicinal plants produce a diverse range of bioactive molecules, which act as best weapons for combating ailments and as a preventive cure against diseases without causing any side effect. Now antibiotic resistant strains of pathogens have been increases, which have led to the emergence of new multi-resistant bacterial strains (Aibinu *et al.*, 2004). In past few years, the active plant extracts are screened to prove antimicrobial activities from medicinal plants (Pretorius *et al.*, 2003, Moreillion *et al.*, 2005).

The plant selected for antimicrobial research work is *Euphorbia hirta* Linn., a perennial herb which belong to family Euphorbiaceae. *Euphorbia hirta* is an erect, small, ascending, annual plant. The stem of plant is hairy and the leaves are oblong, elliptical, acute or subacute. Flowers are small, crowded and numerous in thick cymes. *Euphorbia hirta* Linn. is a ethnomedicinal plant. It has been used in traditional medicines for treating a variety of ailments, including diarrhoea, peptic ulcers, asthma, kidney stones, sterility and venereal diseases. It is important in treating respiratory ailments, especially cough, coryza, bronchitis and asthma.

Pathogen is an organism that causes a disease on living being *Escherichia coli* is gram negative bacteria and *Staphylococcus aureus* is gram positive bacteria.

Most *E. coli* strains are harmless. But some can cause bloody diarrhea. *S. aureus* can cause a range of illness from minor skin infection to 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, nosocomial infections, wound infections and urinary tract infections and have been selected for the present study.

Several workers throughout the world have carried out antimicrobial studies on some medicinal plants including *Betula pendula* (Mukhtar *et al.*, 2002) and *Ageratum houstonianum* (Bowers, 1976). Some scientist have evaluated antibacterial activity of *Euphorbia hirta* against few bacteria associated with infections. (El-Mahmood *et al.*, 2009; Shanmugapriya *et al.*, 2012; Ibrahim *et al.*, 2012).

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

Plant material

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.

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Preparation of ethanol and aqueous plant extracts

Fresh leaf, bud and stem were separated and cleaned with tap water and distilled water followed by shade-dried. The different parts of the plant were powdered, stored and used for extraction. 15 g of each powder was mixed to 150 mL of solvent for 72 hr. The crude extract was filtered through Whatman No. 1 filter paper. The extract was stored in a refrigerator at 4 °C for further use.

Growth and maintenance of test microorganism for antimicrobial studies

Bacterial culture were obtained from the culture collection centre, Birsa Agriculture University, Kanke, Ranchi, Jharkhand, India. The test bacterial species were maintained on nutrient agar media (NAM) for further use.

Antimicrobial Activity

In present study, the extracts of different parts of plant in different solvents were used to inhibit the growth of microorganisms. Antimicrobial activity of extracts using different solvent were measured by Agar disc diffusion method. In this method, the test organism were seeded into nutrient agar medium on the plates. The filter paper discs of 5 mm diameter were prepared using Whatman No. 1 filter paper, impregnated with the extract were placed on the test organism seeded plates. Then plates were incubated at 37°C for 24hours. The experiment was carried out in triplication to get average result. The measurement of diameter of the zone of inhibition shows the anti-microbial activity.

RESULTS AND DISCUSSION

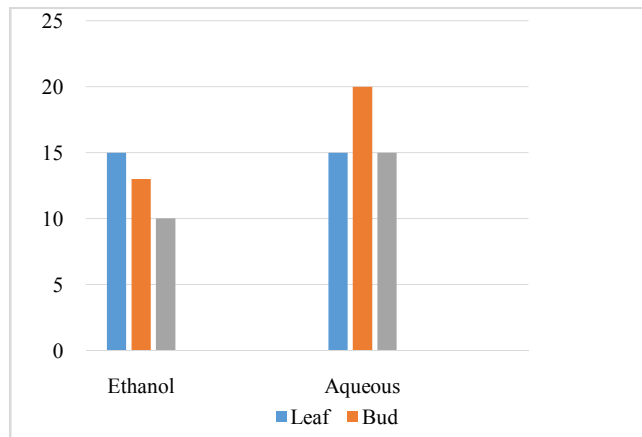
Results of experiment revealed that ethanol and aqueous extracts of different parts of *Euphorbia hirta* L. posses potential antimicrobial activity against some pathogens such as *Escherichia coli* and *Staphylococcus aureus*. The results clearly indicate that bud extract using aqueous solvent showed the maximum *in vitro* inhibition against *E. coli* which offered inhibition zone of 20 mm and zone of inhibition area of 471.00 mm². Further ethanol extract of leaf or aqueous extract of leaf or stem of *E. hirta* were effective against *E. coli* which recorded same significant zone of inhibition of 15 mm and zone of inhibition Area of 294.38 mm². Stem extract in ethanol shows inhibition zone against *E. coli* around 10 mm and zone of inhibition area of 157.00 mm² (Table-1 and Graph – 1).

In case of *S. aureus*, both leaf and bud extracts in ethanol and bud and stem extracts in aqueous solvent which offered same inhibition zone of 15 mm and zone of inhibition area of 294.38 mm². A significant inhibition zone of 13 mm and zone of inhibition area of 234.72 mm² was obtained in leaf extract using aqueous but stem extract in ethanol shows 11 mm inhibition zone and zone of inhibition area of 181.34 mm² (Table-2 and Graph-2).

This study suggested that ethanol and aqueous extracts of different aerial parts of *E.hirta* posses antimicrobial activity against test pathogens. The antimicrobial activity of extracts could be due to presence of various phytoconstituents.

Table 1 Study of Diameter of Zone of Inhibition (DIZ) and Zone of Inhibition Area (ZIA) of Ethanol and Aqueous extract of different parts of *Euphorbia hirta* against *Escherichia coli*.

Solvents→ Parts of Plant ↓	Ethanol		Aqueous	
	DIZ(mm)	ZIA(mm ²)	DIZ(mm)	ZIA(mm ²)
Leaf (Lm)	15	294.38	15	294.38
Bud (Bm)	13	234.72	20	471.00
Stem (Sm)	10	157.00	15	294.38

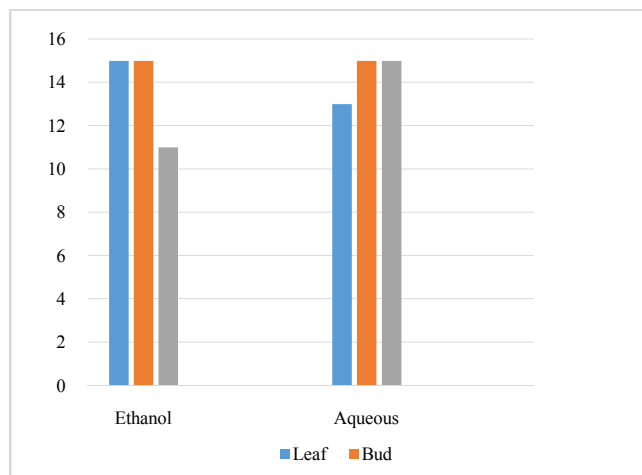


Graph 1 Antibacterial activity of Extracts of different parts of *Euphorbia hirta* using Ethanol and Aqueous solvent against *Escherichia coli*.

Table 2 Study of Diameter of Zone of Inhibition (DIZ) and Zone of Inhibition Area (ZIA) of Ethanol and Aqueous extract of different parts of *Euphorbia hirta* against *Staphylococcus aureus*.

Solvents→ Parts of Plant ↓	Ethanol		Aqueous	
	DIZ(mm)	ZIA(mm ²)	DIZ(mm)	ZIA(mm ²)
Leaf (Lm)	15	294.38	13	234.72
Bud (Bm)	15	294.38	15	294.38
Stem (Sm)	11	181.34	15	294.38

DIZ = Diameter of zone of inhibition in millimeter scale.
ZIA = Zone of Inhibition Area in millimeter square.



Graph 2 Antibacterial activity of Extracts of different parts of *Euphorbia hirta* using Ethanol and Aqueous solvent against *Staphylococcus aureus*.

CONCLUSIONS

From the research work it has been concluded that *E. hirta* extracts using ethanol and aqueous solvent were most effective against *Escherichia coli* and *Staphylococcus aureus*. Out of all the extracts from *E. hirta*, maximum significant antimicrobial activity showed by bud extract using aqueous solvent against *E. coli*. And leaf and bud extracts in ethanol and bud and stem extracts in aqueous solvent shows maximum inhibition against

Staphylococcus aureus. The result of research work have justified the traditional indirect use of plant in curing diseases. Some of these observation have helped in developing drugs for therapeutic use in different diseases.

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