

A study of the antimicrobial activity of methanol and aqueous extracts of *Euphorbia hirta* L

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Abstract

Effect of methanol and aqueous extracts of different aerial parts of *Euphorbia hirta* L. were examined against some bacterial species. Methanol extract of leaf of *E. hirta* was more active against gram negative bacteria *Escherichia coli*. But in case of gram positive bacteria *Staphylococcus aureus*, methanol extract of leaf or bud of *Euphorbia hirta* was more active. A narrow range of antimicrobial activity was exhibited in leaf extract of *E. hirta* using aqueous solvent. *E. coli* and *S. aureus* had been sensitive to the methanol and aqueous extracts of *Euphorbia hirta*.

KEYWORDS: *Euphorbia hirta* L., methanol, aqueous, *Escherichia coli* and *Staphylococcus aureus*.

Introduction

There is a need for discovery of new antimicrobial agents from medicinal plants (Bradford, 2001, Pretorius *et al.*, 2003, Moreillion *et al.*, 2005). Multidrug resistance towards the antibiotics and their related side effects has led to the use of natural drugs (Aibinu *et al.*, 2004). Knowledge on curative medicines by medicinal plants is available in the Atharvaveda, Rigveda and Ayurveda (Poonkothai *et al.*, 2005).

India is a legendary land of natural medicinal and aromatic plants. Plants are the basic source of new medicine. Almost all different parts of the plant like root, stem, leaf, bud, flower, fruit and seeds are known to have various medicinal properties (Chakraborty and Brantmer, 1999). Medicinal plants produce a diverse range of bioactive molecules. The active plant extracts are frequently screened for new drug discoveries and the presence of antimicrobial compounds (Das *et al.*, 1999, Kaushik, 2003).

The plant selected for this study is *Euphorbia hirta* Linn., a perennial herb. It is classified in the family of Euphorbiaceae. It is an erect, small, 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. has been found to possess several ethnomedicinal uses. *E. hirta* is a very popular herb amongst practitioners of traditional medicine, widely used as a decoction or infusion to treat various ailments including intestinal parasites, diarrhea, peptic ulcers, heartburn, vomiting, amoebic dysentery, asthma, bronchitis, hay fever, laryngeal spasms, emphysema, coughs, colds, kidney stones, menstrual problems, sterility and venereal diseases. It is also used to treat affections of the skin and mucous membranes, including warts, scabies. 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.

Many efforts have been made to discover antimicrobial activity 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 pathogenic bacteria (El-Mahmood *et al.*, 2009; Shanmugapriya *et al.*, 2012; Ibrahim *et al.*, 2012).

The objective of the present study was to study the antimicrobial activity of methanol and aqueous extracts of *E. hirta* against bacteria *Escherichia coli* and *Staphylococcus aureus*.

Material and Methods

Preparation of the extract :

The plant specimens were identified. Fresh leaves, stems and buds were separated and cleaned with tap water and distilled water followed by shade-dried at room temperature and powdered. 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 extracts were used further in the determination of the antimicrobial analysis.

Test microorganism for antimicrobial studies

The bacterial strains used for this research work were *Escherichia coli* and *Staphylococcus aureus*. Bacterial cultures 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

Agar disc diffusion method : Antimicrobial activity of extracts using different solvent such as methanol and aqueous were measured by Agar disc diffusion method. In this method, the test organisms were seeded into nutrient agar medium on the petriplates. The filter paper discs (5 mm diameter) were impregnated with the extracts were placed on the test organism seeded plates. Then plates were incubated at 37°C for 24 hours. The experiment was carried out in triplication to get average result. The measurement of diameter of the zone of inhibition shows the antimicrobial activity.

Results and Discussion

The results obtained are summarized in Table-1 and Table-2. It indicates that methanol and aqueous extracts of different parts of *Euphorbia hirta* L. possess potential antimicrobial activity against some pathogens such as *Escherichia coli* and *Staphylococcus aureus*.

The results clearly indicate that methanol extract of leaf of *E. hirta* was more active against gram negative bacteria *Escherichia coli* which offered inhibition zone of 25 mm and zone of inhibition area of 686.88 mm². Further bud extract in methanol and aqueous were effective against *E. coli* which recorded same significant zone of inhibition of 20 mm and zone of inhibition Area of 471.00 mm². Stem extract in methanol and leaf or stem extracts in aqueous shows inhibition zone against *E. coli* around 15 mm and zone of inhibition area of 294.38 mm² (Table-1 and Graph – 1).

But in case of gram positive bacteria *Staphylococcus aureus*, methanol extract of leaf and bud of *E. hirta* was more active which offered inhibition zone of 20 mm and zone of inhibition area of 471.00 mm². A significant inhibition zone of 15 mm and zone of inhibition area of 294.38 mm² was obtained in stem extract using methanol and in bud and stem extract using aqueous. Leaf extract using aqueous shows 13 mm inhibition zone and zone of inhibition area of 234.72 mm² (Table-2 and Graph-2).

E. coli and *S. aureus* had been sensitive to the methanol and aqueous extracts of *Euphorbia hirta*.

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

Bacteria →	<i>Escherichia coli</i>		<i>Staphylococcus aureus</i>	
	DIZ(mm)	ZIA(mm ²)	DIZ(mm)	ZIA(mm ²)
Leaf (Lm)	25	686.88	20	471.00
Bud (Bm)	20	471.00	20	471.00
Stem (Sm)	15	294.38	15	294.38

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 *Escherichia coli* and *Staphylococcus aureus*.

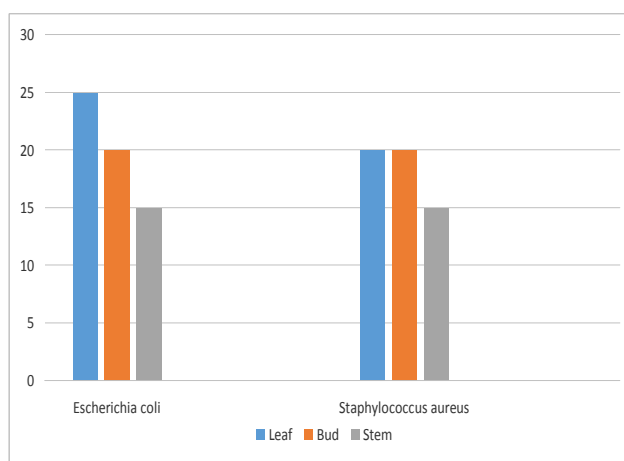


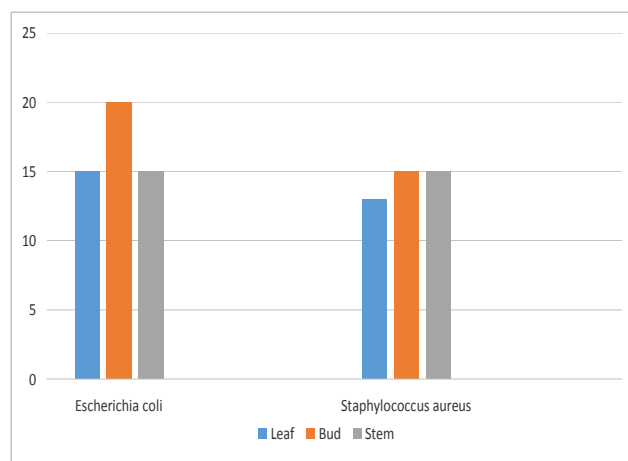
Table 2: Study of Diameter of Zone of Inhibition (DIZ) and Zone of Inhibition Area (ZIA) of **Aqueous** extract of different parts of *Euphorbia hirta* against *Escherichia coli* and *Staphylococcus aureus* .

Bacteria →	<i>Escherichia coli</i>		<i>Staphylococcus aureus</i>	
	DIZ(mm)	ZIA(mm ²)	DIZ(mm)	ZIA(mm ²)
Leaf (Lm)	15	294.38	13	234.72
Bud (Bm)	20	471.00	15	294.38
Stem (Sm)	15	294.38	15	294.38

DIZ = Diameter of zone of inhibition in millimeter scale.

ZIA = Zone of Inhibition Area in millimeter square.

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



Conclusions

In the present work the antimicrobial activity of methanol and aqueous extracts of *E. hirta* against *Escherichia coli* and *Staphylococcus aureus* was quantitatively assessed by diameter of zone of inhibition in millimeter scale. The plant selected is potentially a rich source of antimicrobial agents. The results indicated different activities of methanol and aqueous extracts of plant against the growth of bacteria. Maximum significant antimicrobial activity showed by leaf extract using methanol solvent against *E. coli*. And aqueous extract of leaf and bud shows maximum inhibition against *Staphylococcus aureus*.

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