



## Comparison Between Antibacterial Activity of Methanol or Ethanol Extract of a Medicinal Plant -*Euphorbia hirta* L. Against *Staphylococcus Aureus*

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ABSTRACT

*Staphylococcus aureus* is gram positive bacteria. *S. aureus* can cause a range of illness from minor skin infection to life threatening diseases such as meningitis, pneumonia, osteomyelitis etc. Recent investigation have shown that the antibacterial potential of aerial parts- leaves, buds and stems of *Euphorbia hirta* L. using different solvents such as methanol or ethanol against *Staphylococcus aureus*. Methanol extract was more effective in comparison to ethanol extract. Maximum in vitro inhibition was scored in methanol extract of leaf or bud of *Euphorbia hirta* L. which offered zone of inhibition of 20 mm and zone of inhibition area of 471.00 mm<sup>2</sup> against *Staphylococcus aureus*. A significant inhibition of *S. aureus* was found in ethanol extracts of leaf or bud of *Euphorbia hirta* with same inhibition zone of 15 mm and zone of inhibition area of 294.38 mm<sup>2</sup>.

## KEYWORDS

Antibacterial activity, bud, leaf, stem and *Staphylococcus aureus*.

## Introduction

Plants produce a diverse range of bioactive molecules, which act against diseases of humans and animals. Medicinal plants are a rich source of drugs for the treatment of various health disorders. In recent times, antibiotic resistant strains of clinically important pathogens have been increases, which have led to the emergence of new multi-resistant bacterial strains (Aibinu *et al.*, 2004). At present, the active plant extracts are screened for new antimicrobial drugs with better bioactive potential and least side effects. (Pretorius *et al.*, 2003, Moreillion *et al.*, 2005).

The plant selected for research work is *Euphorbia hirta* Linn., a perennial herb. It is classified in the family of Euphorbiaceae. It 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. The fruits are three celled, hairy and have keeled capsules. They contain three four sided, brown, wrinkled and angular seeds.

*Euphorbia hirta* is an ethnomedicinal plant. It is well known for its diverse biological activities, widely used to treat various ailments including diarrhoea, peptic ulcers, asthma, kidney stones, sterility and venereal diseases. *Euphorbia hirta* has been widely used by Tribal as traditional medicine in a treatment against infectious pathogens. It is important in treating respiratory ailments, especially cough, coryza, bronchitis and asthma.

Gram positive bacteria - *Staphylococcus aureus* can cause a range of illnesses, skin infections, pneumonia, meningitis, osteomyelitis, bacteremia, and sepsis. Its incidence ranges from skin, soft tissue, respiratory, bone, joint, endovascular to wound infections. So to explore antibacterial activity of this herb, the research work has been carried out.

Antibacterial activity of *Euphorbia hirta* against few bacteria associated with infections was evaluated by some scientist. (El-Mahmoud *et al.*, 2009; Shanmugapriya *et al.*, 2012; Ibrahim *et al.*, 2012).

The purpose of the present study was to explore antibacterial activity of different parts of *E. hirta* using different solvents against disease causing bacteria - *Staphylococcus aureus*.

## Materials and Methods

## Plant material

*Euphorbia hirta* was collected as whole plant from different locations of Ranchi district of Jharkhand, India during the month of November.

## Preparation of the Extract

Fresh leaves, buds and stems 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 powder was mixed to 150 mL of methanol for 72 hr. The crude extract was passed through Whatman No. 1 filter paper and then concentrated. After complete solvent evaporation, extracts were weighed and stored in a refrigerator at 4 °C for further use. 250 mg of solvent residue was dissolved in 5 mL of solvents were used as the test extracts for antibacterial activity assay.

## Test Bacteria

Gram-positive bacteria such as *Staphylococcus aureus* was collected from Birsa Agriculture University, Kanke, Ranchi, Jharkhand, India. The test bacterial species was maintained on nutrient agar media for further use.

## Antibacterial Activity

*Staphylococcus aureus* was tested for their susceptibility to the solvent extracts. Antibacterial activity of extracts using different solvent were determined by Agar disc diffusion method. The filter paper discs of 5 mm diameter were prepared using Whatman No. 1 filter paper, soaked in extract and also discs dipped in respective solvent were used as negative controls. After sterilization, test bacteria was spread on the plates with a sterile swab moistened with the bacterial suspension. Then plates were incubated at 37°C for 24 hours in upright position and the zone of inhibition was recorded. The experiment was carried out in triplication to get average result.

## Results and Discussion

The results of antibacterial activity of solvent extracts of different parts of *Euphorbia hirta* L. against test bacteria *Staphylococcus aureus* were shown in Table-1 and Graph - 1. It was found that all extracts of solvents of plant *E. hirta*

were found to inhibit growth of test bacteria. The susceptibility of the test bacteria varies with the type of solvent of same plant parts used. Methanol extracts were found to possess more antibacterial activity than ethanol extracts. Among treatments, methanol extract of leaf or bud showed maximum antibacterial activity with zone of inhibition of 20 mm and zone of inhibition area of 471.00 mm<sup>2</sup>.

Further methanol extract of stem or ethanol extract of leaf or bud of *E. hirta* were effective against *S. aureus* which recorded same significant zone of inhibition of 15 mm and zone of inhibition Area of 294.38 mm<sup>2</sup>.

A significant inhibition zone of clinical bacteria *S. aureus* was found in ethanol extract of stem of *E.hirta* showing 11mm inhibition zone and zone of inhibition Area of 181.34 mm<sup>2</sup>.

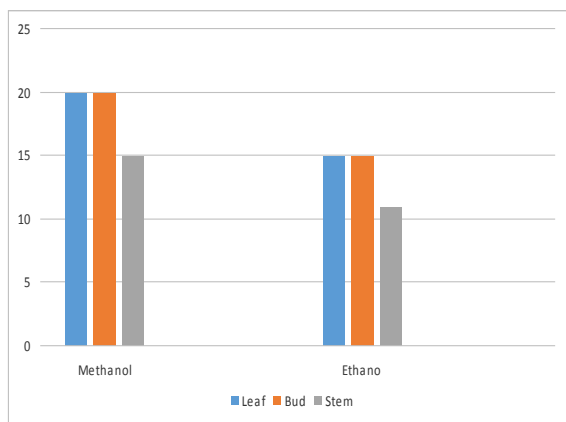
This study suggested that methanol or ethanol extracts of different aerial parts of *E.hirta* possesses antibacterial activity. The antibiotic activity of extract could be due to presence of various phytoconstituents.

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

Solvents	Methanol		Ethanol	
	DIZ(mm)	ZIA(mm <sup>2</sup> )	DIZ(mm)	ZIA(mm <sup>2</sup> )
Leaf (Lm)	20	471.00	15	294.38
Bud (Bm)	20	471.00	15	294.38
Stem (Sm)	15	294.38	11	181.34

DIZ = Diameter of zone of inhibition in millimeter scale.

ZIA = Zone of Inhibition Area in millimeter square.



**Graph 1:** Antibacterial activity of Extracts of different parts of *Euphorbia hirta* using Methanol or Ethanol solvent against *Staphylococcus aureus*.

**Conclusions**

The result of this study showed *E. hirta* extracts using methanol or ethanol was most effective against *Staphylococcus aureus*. Out of all the extracts from *E. hirta*, the methanol extract was the most active. The result of research work have justified the traditional indirect use of plant in curing diseases. It may be due to the presence of secondary metabolites like alkaloids, tannins, saponins and flavonoids of plant.

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