

Antibacterial activity of extracts of different parts of *Euphorbia hirta* using Dimethyl sulfoxide , Aqueous and Methanol solvents against *Escherichia coli* and *Staphylococcus aureus*

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Abstract

Antibacterial activity of extracts of different parts of *Euphorbia hirta* L. using Dimethyl sulfoxide , Aqueous and Methanol solvents against *Escherichia coli* and *Staphylococcus aureus* were evaluated using Agar Disc Diffusion method.

Aerial parts such as leaf, bud and stem extracts were extracted using dimethyl sulfoxide , aqueous and methanol solvents . In case of *E. coli* , maximum *in vitro* inhibition was scored in leaf extract using methanol solvent which offered inhibition zone of 25 mm and zone of inhibition area of 686.88 mm² . In case of *S. aureus* , both leaf and bud extracts in methanol solvent which offered same inhibition zone of 20 mm and zone of inhibition area of 471.00 mm² . A significant inhibition was also found in other extracts of *Euphorbia hirta* against *E. coli* and *S. aureus*.

KEYWORDS: Antibacterial activity, solvents, extracts, *Escherichia coli* and *Staphylococcus aureus*

Introduction

World Health Organization has recorded more than twenty thousands medicinal plants used in different parts of the World. Relatively small percentages of these are used as foods by humans and other animal species. Only about 10,000 plants are used as medicine in India. It is possible that many more are used for medicinal purposes . The use of plant extracts in treatment of infection is common in a large part of the world, especially in developing countries , where people use traditional medicine for a variety of diseases (Shiba et al.,2005). Medicinal plants are a rich source of drugs for the treatment of various health disorders . Antibiotic resistant strains of bacteria have been increases ,which have led to the emergence of new multi-resistant bacterial strains (Aibinu *et al.*, 2004). As a result of current problems associated with the use of antibiotics, interest in plants extracts with antimicrobial activities has been revived (Pretorius *et al.*, 2003, Abu-Shanab et al., 2004, Moreillion et al., 2005).

Euphorbia hirta Linn., a perennial herb which belong to family Euphorbiaceae. *Euphorbia hirta* is 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. is a ethnomedicinal plant. It is used as medicines for treatment of variety of ailments like diarrhoea, peptic ulcers, asthma ,kidney stones, sterility and venereal diseases. It is important in treating respiratory ailments, especially cough, coryza, bronchitis and asthma . The medicinal value of any plants lies in some bioactive chemical substances that produce a definite physiological action on infected organisms. *Escherichia coli* is gram negative bacteria and *Staphylococcus aureus* is gram positive bacteria. Harmful pathogen *E. coli* can cause bloody diarrhea. *S. aureus* can cause skin infection, meningitis, pneumonia , steomyelitis etc. Both bacteria have been proved to be major causal organisms of

various human infections like nosocomial infections, wound infections, food poisoning and urinary tract infections. Both harmful bacteria have been selected for the present research work. Some scientist throughout the world have carried out antimicrobial studies on *Euphorbia hirta* against few bacteria . (El-Mahmood et al.,2009; Shanmugapriya et al.,2012 ; Ibrahim et al.,2012).

The main purpose of the present study was to find out antibacterial activity of extracts of different parts of *Euphorbia hirta* L. using dimethyl sulfoxide , aqueous and methanol solvents against *Escherichia coli* and *Staphylococcus aureus*.

Material and Methods

Aerial parts of *Euphorbia hirta* L. such as leaf , bud and stem were collected from different regions of Ranchi district of Jharkhand , India . Different parts of plant were separated and washed thoroughly with running tap 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 extract was filtered and concentrated . For further use , extract was stored in a refrigerator at 4 °C .

Culture of bacteria was collected from Birsa Agriculture University, Kanke , Ranchi, Jharkhand, India. The test bacterial species were maintained on nutrient agar media (NAM) for further use.

Antibacterial activity of Dimethyl sulfoxide , Aqueous and Methanol extracts :

The efficacy of dimethyl sulfoxide , aqueous and methanol extract of *Euphorbia hirta* L. were tested against gram negative bacteria- *Escherichia coli* and gram positive bacteria - *Staphylococcus aureus* by Agar disc diffusion method. In this method, the test organism were swabbed uniformly on solidified sterile , nutrient agar medium on the plates using sterile cotton swab. Then , aseptically filter paper discs of 5 mm diameter were bored in the inoculated plates . Then plates were incubated at 37°C for 24hours .The zone of inhibition was recorded . The experiment was carried in triplicates to get average reading.

Results and Discussion

The result of antibacterial activity of dimethyl sulfoxide , aqueous and methanol extracts of *Euphorbia hirta* L. is given in Table -1. Results were recorded as diameter of zone of inhibition (DIZ) in millimeter scale . The inhibitory zone around the disc indicated the control of bacterial growth. It is clear that the dimethyl sulfoxide , aqueous and methanol extracts of *Euphorbia hirta* L. were more active against *Escherichia coli* than *Staphylococcus aureus*.

The results clearly indicate that leaf extract using methanol solvent showed the maximum *in vitro* inhibition against *E. coli* which offered inhibition zone of 25 mm and zone of inhibition area of 686.88 mm² . Further methanol extract of bud and aqueous extract of bud and dimethyl sulfoxide extract of leaf of *E. hirta* 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 bud extract in dimethyl sulfoxide and leaf or stem extract 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) .

The maximum *in vitro* inhibition against *S. aureus* was scored in leaf and bud extracts in methanol 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, bud or stem extract using aqueous and leaf or bud extract using dimethyl sulfoxide solvent. Stem extract in dimethyl sulfoxide shows 10 mm inhibition zone and zone of inhibition area of 157.00 mm² (Table-1 and Graph-2).

This study suggested that dimethyl sulfoxide, aqueous and methanol extracts of *Euphorbia hirta* L. possess antibacterial activity against test pathogens. The antibacterial activity of extracts could be due to presence of various bio-active compounds.

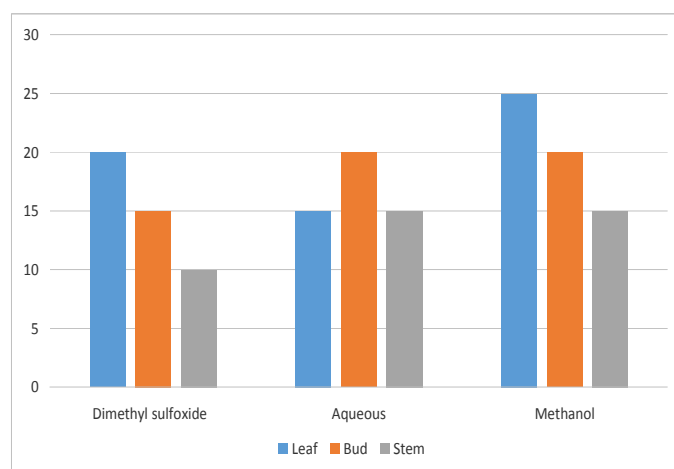
Table 1: Study of Diameter of Zone of Inhibition (DIZ) and Zone of Inhibition Area (ZIA) of Dimethyl sulfoxide, Aqueous and Methanol extracts of different parts of *Euphorbia hirta* against *Escherichia coli* and *Staphylococcus aureus*.

Solvents	Parts	<i>Escherichia coli</i>		<i>Staphylococcus aureus</i>	
		DIZ(mm)	ZIA(mm ²)	DIZ(mm)	ZIA(mm ²)
Dimethyl sulfoxide	Leaf	20	471.00	15	294.38
	Bud	15	294.38	15	294.38
	Stem	10	157.00	10	157.00
Aqueous	Leaf	15	294.38	13	234.72
	Bud	20	471.00	15	294.38
	Stem	15	294.38	15	294.38
Methanol	Leaf	25	686.88	20	471.00
	Bud	20	471.00	20	471.00
	Stem	15	294.38	15	294.38

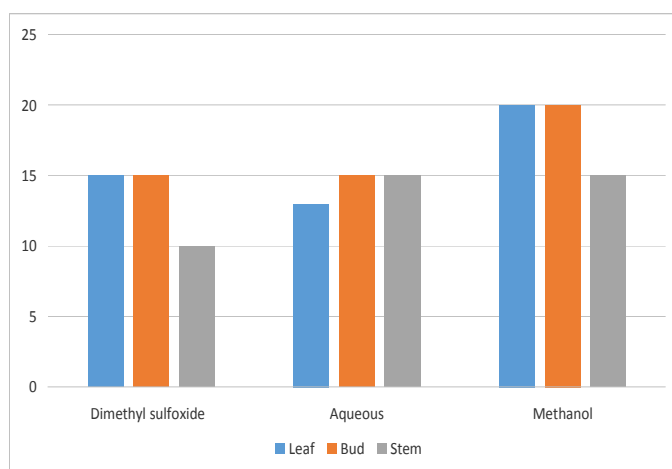
DIZ = Diameter of Zone of Inhibition in millimeter scale.

ZIA = Zone of Inhibition Area in millimeter square.

Graph 1: Antibacterial activity of Extracts of different parts of *Euphorbia hirta* using Dimethyl sulfoxide, Aqueous and Methanol solvents against *Escherichia coli*.



Graph 2: Antibacterial activity of Extracts of different parts of *Euphorbia hirta* using Dimethyl sulfoxide , Aqueous and Methanol solvents against *Staphylococcus aureus* .



Conclusions

In recent years, development of antibiotic resistance in the pathogenic bacteria has created major problem in treatment of infectious diseases (Davies, 1994 , Maddux and Barrere , 1980) . This problem led to increase interest in search of new antibacterial medicines . From the research work it has been concluded that *E. hirta* extracts using dimethyl sulfoxide , aqueous and methanol extracts of *Euphorbia hirta* L. were most effective against *Escherichia coli* and *Staphylococcus aureus* . The result of research work have justified the extracts of *Euphorbia hirta* L. could be used to treat infections caused by these pathogenic bacteria.

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References

1. Abu-Shanab ,B., Adwan , G. and Abu- Safiya, D. 2004. Antibacterial activities of some plant extracts used in Palestine in popular medicine. *Turk. J. Biol.*, 28 : 99-102.
2. Aibinu, I, Adenipekun, E and Odugbemi, T. 2004. Emergence of Quinolone Resistance amongst *Escherichia coli* strains isolated from clinical infections in some Lagos State Hospitals in Nigeria. *Nigerian Journal of Health and Biomedical Science*. 3(2):73-78.
3. Davies, J. 1994. Inactivation of antibiotics and the dissemination of resistance genes. *Science*, 264: 375-382.

4. El-Mahmood Muhammad Abubakar, 2009. Antibacterial activity of crude extracts of *Euphorbia hirta* against some bacteria associated with enteric infections. *Journal of Medicinal Plants Research* Vol. 3(7), pp. 498-505, ISSN 1996-0875.
5. Ibrahim T.A., Adetuyi F.O. and Ajala Lola, 2012. Phytochemical screening and antibacterial activity of *Sida acuta* and *Euphorbia hirta*. *Journal of Applied Phytotechnology in Environmental Sanitation* 1(3):113-119; ISSN 2088-6586.
6. Maddux, M.S. and Barrere ,S.L. 1980. A review of complications of amphotericin-B therapy: recommendations for prevention and management. *Drug Intelligence and Clin. Pharmacy*. 14 : 177-181.
7. Moreillion,P., Que,Y.A., and Glauser,M.P, 2005. *Staphylococcus aureus* (Including Staphylococcal Toxic shock). In 'Principles and Practice of Infectious diseases.' (Ed.) Mandell G.L, Bennett J.E, Dolin R. Published by *Churchill livingstone Pennsylvania* 6th ed. 2: 2333- 2339.
- 8 Pretorius, J.C., Magama S., and Zietsman P.C.,2003. Growth inhibition of plant pathogenic bacteria and fungi by extracts from selected South African plant species *South African Journal of Botany* 20: 188-192.
9. Shanmugapriya Perumal, Suthagar Pillai, Lee Wei Cai,Roziahanim Mahmud, Surash Ramanathan, 2012. Determination of Minimum Inhibitory Concentration of *Euphorbia hirta* (L.) Extracts by Tetrazolium Microplate Assay, *Journal of Natural Products* Volume 5 , 68-76;ISSN 0974 – 5211.
10. Shiba, H., Kondo, K. and Katsuyama, R. 2005. Alkyl gallates intensifiers of beta lactam susceptibility in methicillin resistant *Staphylococcus aureus* . *Antim. Agents and Chemotherapy*, 49: 549-555.