

Antibacterial activity of Ethanol, Dimethyl sulfoxide and Aqueous extracts of *Euphorbia hirta* L.

Indu Kumari *

Assistant Professor, Department of Botany, Nirmala College, Doranda, Ranchi, Jharkhand, India

*Author Email: induraj0016@gmail.com

Abstract: Crude extracts of *Euphorbia hirta* L. using different solvents like Ethanol, Dimethyl sulfoxide and Water have shown potential role in controlling harmful human pathogen *Escherichia coli*. Extracts and active principles from medicinal plants are one of the safest and ecofriendly methods for the treatments of various diseases. Medicinal plant *Euphorbia hirta* L. has been reported as antidiarrheal, antimicrobial, antioxidant, anticancer, and antidepressant for blood pressure. Antibacterial activity of ethanol, dimethyl sulfoxide and aqueous extracts of *Euphorbia hirta* L. were tested against test bacteria *Escherichia coli* using the agar disc diffusion method. Dimethyl sulfoxide extract of leaf and aqueous extract of bud were found to be more active, whereas ethanol extract of leaf, dimethyl sulfoxide extract of bud and aqueous extract of stem or leaf possessed moderate effect on the test bacteria. These results may suggest the distribution of antibacterial compound in aerial parts of *Euphorbia hirta* L. that can be explored for the isolation of bioactive compound.

Keywords: *Euphorbia hirta* L., Ethanol, Dimethyl sulfoxide, Aqueous and *Escherichia coli*.

1. INTRODUCTION

Euphorbia hirta L. (family Euphorbiaceae) is small erect or prostrate annual herb, common to tropical countries (Soforowa, 1982; Satyavati, 1987). It is medicinal plant, can grow long with hairy stem that produces white latex (Lind and Tallantire, 1971; Anononymous, 2005). Leaves are simple, elliptical, hairy with a finely dentate margin. Leaves occur in opposite pairs on the stem. The flowers are purplish to greenish in color, dense, unisexual, found in axillary cymes. The fruit is a capsules with three valves and produces tiny, reddish-brown, initially smooth, later slightly transversely wrinkled seeds. It has a white or brown taproot. Flowering and fruiting occur throughout the year. *Euphorbia hirta* L. is a hairy herb that grows in open grasslands, roadsides and pathways.

Euphorbia hirta has medicinal values such as exhibits anxiolytic, analgesic, anti-inflammatory, antidiarrheal, antioxidant, antiamebic, antimalarial, antifungal and antibacterial etc. *Euphorbia hirta* is used in the treatment of cough, asthma, bronchitis, fever, diarrhea, dysentery, eyelid styes, bowel complaints, wounds, kidney stones and cancer (Galvez et al., 1993; Lanhers et al., 1991; Johnson et al., 1999).

Harmful Bacteria are the most important pathogens causing severe fatal infections in human beings. *Escherichia coli* are bacteria found in the environment, foods, and intestines of people and animals. Some harmful strains of *E. coli* can cause respiratory illness, pneumonia, diarrhea, urinary tract infections and other illnesses.

Normally *Escherichia coli* live in lower intestine of warm-blooded organisms. Few strains of *E. coli* can cause severe abdominal cramps, bloody diarrhea and vomiting.

Resistant strains of harmful bacteria are continuously increasing, imposing the need for a continuous research and development of effective antibacterial medicines (Barbour et al., 2004; Machado et al., 2003; Rojas et al., 2003). The non-availability and high cost of new antibiotics with limited effective span have resulted in increase in mortality (Williams, 2000). Medicinal plants are effective natural antibacterial agents that can be used for the synthesis of new antibacterial drugs (Farombi, 2003, Pretorius *et al.*, 2003, Moreillion et al., 2005, Benko- Iseppon and Crovella 2010, Dionisi et al. 2012). Utilization of medicinal plants for the treatment of various diseases has been documented (Tona et al, 2000; Muhammad, 2005; Falodun et al., 2006; Ravindra and Vijay Kumar, 2007).

Extracts of *Euphorbia hirta* are effective against some few bacteria (El-Mahmood et al. 2008; Suresh et al., 2008; Sunil Kumar et al., 2010., Ibrahim *et al.*, 2012; Shanmugapriya *et al.*, 2012). In present research work, we evaluate the antibacterial activity of ethanol, dimethyl sulfoxide and aqueous extracts of *Euphorbia hirta* against harmful bacteria *Escherichia coli*.

2. MATERIALS AND METHODS

Preparation of Extracts

Healthy and fresh aerial parts of *Euphorbia hirta* L. (stem, leaf and bud) were collected from different location of Ranchi district of Jharkhand, India. Different parts of plant were separated and washed thoroughly with running tap water and dried under shade condition. The dried different parts were powdered. 15 g of each powder was soaked separately in 150 ml of solvent for 3 days. The extracts were filtered through Whatman filter paper. The filtrate was evaporated to dryness. Concentrated extracts were weighed and stored in a refrigerator at 4 °C.

Evaluation of antibacterial activity

Test pathogenic 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. The agar disc diffusion method was adopted to evaluate antibacterial activity of ethanol, dimethyl sulfoxide and aqueous extracts of *Euphorbia hirta* L. against test bacteria *Escherichia coli*. In disc diffusion method test bacteria were seeded uniformly on solidified sterile nutrient agar medium on sterile Petri-dishes. Discs of 5 mm diameter (prepared by Whatman No. 1 filter paper) were soaked in extracts and placed in the inoculated Petri-dishes. Then petridishes were incubated at 37°C for 24 hours. The inhibition zone were measured. The experiments were carried in triplicates to get average reading.

3. RESULTS AND DISCUSSION

The antibacterial activity of different extracts of *Euphorbia hirta* were assessed using the agar disc diffusion method by measuring the diameter of growth inhibition zones (Table -1 and Graph-1). The results showed that ethanol, dimethyl sulfoxide and aqueous extracts of *Euphorbia hirta* L. possesses antibacterial activity against test bacteria *Escherichia coli*.

Among treatments dimethyl sulfoxide extract of leaf and aqueous extract of bud of *Euphorbia hirta* L. were found to be more active, exhibit relatively higher zone of inhibition of 20 mm and zone of inhibition area of 686.88 mm². Ethanol extract of leaf, dimethyl sulfoxide extract of bud and aqueous extract of stem or leaf possessed moderate effect on the test bacteria which offered 15 mm of inhibition zone and zone of inhibition area of 294.38 mm².

The growth of bacteria was suppressed by ethanol extract of bud of *Euphorbia hirta* L. against *Escherichia coli* which recorded inhibition zone of 13 mm and zone of inhibition Area of 234.72 mm². Whereas ethanol or dimethyl sulfoxide extract of stem shows least inhibition zone against *E. coli* with zone of inhibition zone of 10 mm and zone of inhibition Area of 157.00 mm².

These results may suggest the growth of bacteria was suppressed by phytochemical compounds of ethanol, dimethyl sulfoxide and aqueous extracts of *Euphorbia hirta* L. with different magnitudes.

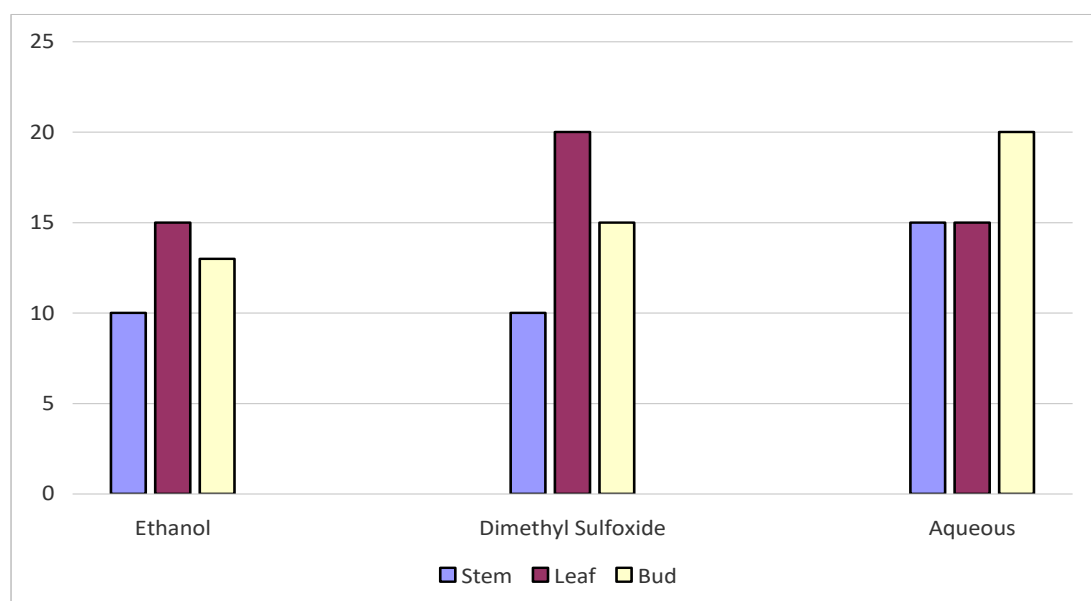
Table 1: Evaluation of antibacterial activity of Ethanol, Dimethyl sulfoxide and Aqueous extracts of *Euphorbia hirta* L. against *Escherichia coli*.

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

DIZ = Diameter of zone of inhibition in millimeter scale.

ZIA = Zone of Inhibition Area in millimeter square.

Graph 1: Antibacterial activity of Ethanol, Dimethyl sulfoxide and Aqueous extracts of *Euphorbia hirta* L. against *Escherichia coli*.



4. CONCLUSIONS

The results of experiment showed that ethanol, dimethyl sulfoxide and aqueous extracts of *Euphorbia hirta* L. possesses antibacterial activity against test bacteria *Escherichia coli*. Some scientists have observed antibacterial activity of some plant extracts due to the presence of secondary metabolites. (Akujobi et al., 2004; Nweze et al., 2004; Osadebe and Ukwueze, 2004). Some researchers have also identified bioactive compounds like tannins, flavonoids and alkaloids in the extracts of some medicinal plant (Esimone et al., 1998; Srinivasan, 2001; Draughon, 2004). *Euphorbia hirta* L. are used in some diseases like diarrhoea and dysentery (Kokwaro, 1993; Igoli et al., 2005). The significant inhibition zone was observed by the extracts of *Euphorbia hirta* L. against *Escherichia coli* justified its use by traditional practitioners in the control of diarrhea and dysentery. Research work is necessary to find out of antibacterial compounds from *Euphorbia hirta* L.

ACKNOWLEDGEMENTS

Parts of research project explained here was supported by UGC- PSJ-007/12-13 (ERO). The authors are thankful to Professor R. K. Pandey, University Professor, University Department of Botany, Ranchi University, Ranchi for providing required laboratory facilities.

REFERENCES

- [1] Akujobi C, Anyanwu BN, Onyeze C, Ibekwe VI .,2004. Antibacterial Activities and Preliminary Phytochemical Screening of Four Medicinal Plants. *J. Appl. Sci.* 7(3): 4328–4338.
- [2] Anonymous - The use of *Euphorbia hirta* in the treatment of sores boils and wounds. Personal communication with the Chairman, Imo state Traditional Medicine Practitioners, Owerri Nigeria 2005.
- [3] Barbour, E.K., Al Sharif, M., Sagherian, V.K., Habre, A.N., Talhouk, R.S. and Talhouk, S.N., 2004. Screening of selected indigenous plants of Lebanon for antimicrobial activity. *J. Ethnopharmacol.*, 93(1): 1–7.
- [4] Benko-Iseppon AM, Crovella S - Ethnobotanical bioprospection of candidates for potential antimicrobial drugs from Brazilian plants: state of art and perspectives. *Curr Protein Pept Sci* 2010; 11:189–194.
- [5] Dionisi HM, Lozada M, Olivera NL - Bioprospection of marine micro-organisms : biotechnological applications and methods. *Rev Argent Microbiol* 2012; 44 : 49–60.
- [6] Draughon FA .,2004. Use of Botanicals as Biopreservatives in Foods. *Food Technol.* 58(2): 20-28.
- [7] El-Mahmood AM, Doughari JH, Chanji FJ - *In-vitro* antibacterial activities of crude extracts of *Nauclea latifolia* and *Daniella oliveri*. *Sci. Res. Essay* 2008; 3(3):102-105.
- [8] Esimone CO, Adiukwu MU, Okonta JM (1998). Preliminary Antimicrobial Screening of the Ethanolic Extract from the Lichen *Usnea subfloridans* (L). *J. Pharmaceutic. Res. Dev.* 3(2): 99 – 102.
- [9] Falodun A, Okunrobo LO, Uzoamaka N .,2006. Phytochemical screening and anti- inflammatory evaluation of methanolic and aqueous extracts of *Euphorbia heterophylla* Linn⁹Euphorbiaceae. *Afr. J. Biotechnol.* 5(6):529-531.
- [10] Farombi EO - African indigenous plant with chemotherapeutic potential and biotechnological approval to the production of bioactive prophylactic agent. *Afr Biotech* . 2003; 2: 662-667.
- [11] Galvez J, Zarzuelo A, Crespo ME, Lorente MD, Ocete MA, Jimenez J. Antidiarrheal activity of *Euphorbia hirta* extract and isolation of an active flavanoid constituent. *Planta Med.* 1993;59:333–36.
- [12] Galvez J, Crespo ME, Jimenez J, Suarez A, Zarzuelo A. Antidiarrheic activity of quercitrin in mice and rats. *J Pharm Pharmacol.* 1993;45:157.
- [13] Ibrahim T.A., Adetuyi F.O. and Ajala Lola - Phytochemical screening and antibacterial activity of *Sida acuta* and *Euphorbia hirta*. *Journal of Applied Phytotechnology in Environmental Sanitation* 2012; 1(3):113-119; ISSN 2088-6586.
- [14] Igoli JO, Ogaji TAm, Tor-Anyiin Igoli NP - Traditional Medicine Practice Amongst the Igede People of Nigeria. Part II. *African. J. Traditional, Compl. Alt. Med.* 2005; 2(2): 134–152.
- [15] Johnson PB, Abdurahman EM, Tiam EA, Abdu-Aguye I, Hussaini IM. *Euphorbia hirta* leaf extracts increase urine output and electrolytes in rats. *J Ethnopharmacol.* 1999;65:63–9.
- [16] Kokwaro JO - Medicinal Plants in East Africa. 2nd edn. East African Literature Bureau, Nairobi, Kenya 1993.
- [17] Lanhers MC, Fleurentin J, Dorfman P, Mortier F, Pelt JM. Analgesic, antipyretic and antiinflammatory properties of *Euphorbia hirta*. *Planta Med.* 1991;57:225–31.
- [18] Lind EM, Tallantire AC - Some Common Flowering Plants of Uganda. Oxford University Press, Nairobi. 1971; p182.

- [19] Machado T B, Pinto A V, Pinto M C F R, Leal I C R, Silva M G, Amaral A C F, Kuster R M, Netto – dosSantos K R, 2003. *In-vitro* activity of Brazilian medicinal plants, naturally occurring naphthoquinones and their analogues, against methicillin-resistant *Staphylococcus aureus*. *Int. J. of Antimicrobial Agents* 21:279-284.
- [20] Moreillon,P., Que,Y.A., and Glauser,M.P - *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. 2005; 2: 2333- 2339.
- [21] Nweze EI Okafor JI, Njoku O - Antimicrobial activities of methanolic extracts of *Trema guineensis* (Schumm and Thorn) and *Morinda lucida* Benth used in Nigerian Herbal Medicinal Practice. *J.Biol. Res. Biotechnol.* 2004; 2(1): 39–46.
- [22] Osadebe PO, Ukwueze SE - A Comparative Study of the Phytochemical and Antimicrobial Properties of the Eastern Nigerian Species of African Mistletoe (*Loranthus micranthus*) sourced from different host trees. *J. Biol. Res. Biotechnol.* 2004; 2(1): 18–23.
- [23] Pretorius, J.C., Magama S., and Zietsman P.C.- Growth inhibition of plant pathogenic bacteria and fungi by extracts from selected South African plant species *South African Journal of Botany* 2003; 20: 188-192.
- [24] Rojas R, Bustamante B, Bauer J, 2003. Antimicrobial activity of selected Peruvian medicinal plants. *J. Ethnopharm.* 88: 199-204.
- [25] Ravindra, B.M. and Vijay Kumar, S.- Assessment of antifungal activity of some medicinal plants, *International Journal of pharmacology*, 2007; Vol 3(6) : 499-504.
- [26] Satyavati GV, Gupta AK, Tandon N.- Medicinal Plants of India, vol. II. Indian Council of Medical Research, New Delhi, 1987; 490p.
- [27] Shanmugapriya Perumal, Suthagar Pillai, Lee Wei Cai,Roziahanim Mahmud, Surash Ramanathan - Determination of Minimum Inhibitory Concentration of *Euphorbia hirta* (L.) Extracts by Tetrazolium Microplate Assay, *Journal of Natural Products* 2012; Volume 5 , 68-76;ISSN 0974 – 5211.
- [28] Soforowa EA - Medicinal plants and traditional medicine in Africa. *John Wiley and Sons, Chichester.* 1982; p. 198.
- [29] Srinivasan, K., Muruganandan, S., Lal, J.,Chandra, S., Tandan, S.K. and Ravi Prakash, V.(2001) Evaluation of anti-inflammatory activity of *Pongamia pinnata* leaves in rats. *Journal of Ethnopharmacology.* 78: 151-157.
- [30] Sunil Kumar, Rashmi Malhotra and Dinesh Kumar - *Euphorbia hirta*: Its chemistry, traditional and medicinal uses, and pharmacological activities .*Pharmacogn Rev.* 2010; Jan-Jun; 4(7): 58–61.
- [31] Suresh K, Deepa P, Harisaranraj R, Vaira Achudhan V. - Antimicrobial and phytochemical investigation of the leaves of *Carica papaya* L., *Cynodon dactylon* (L.) Pers., *Euphorbia hirta* L., *Melia azedarach* L. and *Psidium guajava* L. *Ethnobotanical Leaflets* ; 2008; 12:1184-9.
- [32] Tona L, Kambu K, Ngimbi N, Mesia K, Penge O, Lusakibanza M, et al. Antiamoebic and spasmolytic activities of extracts from some Antidiarrhoeal traditional preparations used in Kinshasa and Congo. *Phytomedicine.* 2000; 7:31–8.
- [33] Williams, R., 2000. Antimicrobial resistance a global threat. *Essential Drug Monitor*, 28-29:14.