



PHARMACOLOGY AND BIOLOGICAL PROPERTIES OF *Euphorbia hirta* LINN: A REVIEW

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ABSTRACT

The plant *Euphorbia hirta* is widely used for its medicinal properties like anti-bacterial, anti-fungal, anti-tumor, anti diabetic etc. Also there is a wide variety of chemical compounds present in *Euphorbia hirta* sap, which are responsible for biological activity of the plant and some of them are toxic and potent. The intention of the review is to make available information regarding pharmacological and biological activities of *Euphorbia hirta* as these informations may prove beneficial in scientific research of the plant and for their potential therapeutic uses.

KEYWORDS: *Euphorbia hirta*, Phytochemistry, Pharmacology, Flavonoids.

INTRODUCTION

Euphorbia hirta Linn. (Family- Euphorbiaceae) is an annual medicinal weed and it is commonly known as Asthma plant. Its not only a weed, but it's a medicinal herb, too. These medicinal herbs are found in tropical and temperate parts of the world along with India, Bangladesh, Africa and Australia. Plants of the genus *Euphorbia* are commonly called "Spurge", some are commonly cultivated as ornamentals, or collected and highly valued for aesthetic appearance of their unique floral structures. The plants share the feature of having a poisonous milky white Latex like sap, that exude when cut. This genus is best known for its many succulent species, some of which appear very similar to cacti.

Taxonomy

Kingdom: Plantae

Subkingdom: Viridiplantae

Division: Tracheophyta

Class: Magnoliopsida

Order: Malpighiales

Family: Euphorbiaceae

Genus: *Euphorbia*

Species: *hirta*

MORPHOLOGY

A hairy, annual herb, growing upto 50cm high, reddish or purplish in colour. Erected plant but generally bent back in the extremity, usually branched from the base, with branches spreading or ascending branches toothed at the edge. Tap root. Stems are covered with purplish – brown hairs and exude white latex when cut. Leaves are

opposite, narrowly ovate in shape, 1-3 cm long and 1-1.5cm wide, asymmetrical, acute at the apex, blotched with purple in the middle, rather finely toothed and hairy on the surface. The inflorescence Cymes collected in dense axillary or terminal clusters, sub- globose and pedicelled. The flowers are small, unisexual, staminate and pistillate, greenish, assembled in the same involucre, which is cup shaped, four toothed at the top, the teeth alternating with minute glands. The fruit is Capsule globose, dehiscent, three angled with three locules containing each a seed, covered with very short hairs. The seed is red brown, 1mm long, slightly transversally ribbed or wrinkled when dry. It reproduces from seeds. It's a common weed of arable fields, waste areas, gardens and roadsides.

Uses

Euphorbia hirta has many medicinal properties like Hypotensive, anti cancer, analgesic, anti malarial, antiasthmatic. antidiarrheal, antioxidant, anti amoebic, anti inflammatory, anti fungal, anti bacterial, antispasmodic etc. It is used in treatment of cancer, diarrhea, dysentery, fever, cough, bowel complaints, helminthic infestations, abscesses etc. Decoction of dry herbs is used for skin diseases. Decoction of fresh herbs is used as gargle for the treatment of thrush. Root decoction is used for nursing mothers deficient in milk and in the treatment of snake bites and vomiting.

Euphorbia hirta is very effective in reducing the sperm mobility and density. Consuming it regularly results in infertility. In traditional medicinal systems it is used in the treatment of asthma.

The common name for *Euphorbia hirta* is Snakeweed. In Hindi it is known with the name Dudhi and the Sanskrit name is Dugadhika. It is popular folklore medicine for relieving dengue in Philippines.

Edible Uses

Leaves and tender shoot tips of dudhi along with leaves of other wild herb are used in saag preparation. In villages saag prepared in this manner is known as bhujji and is served with rice or chapatti. In other parts of India, dried plant parts viz. root, stem, and leaves are used as a green tea for its medicinal value. Extract of dudhi plant due to rich nutrient content is used as herbal dietary supplement and also sold in market.

Dudhi as a source of income

Dudhi plant is known for its tremendous economical potential in other parts of the country. Dried root, leaf and stem of dudhi are sold as green tea, in the name of Twa-Twa tea, and a herbal dietary supplement in the name of Euphorbia is prepared from its extract due to its rich nutrients contents in different parts of India. Thus poor people can treat dudhi plant as a good source of livelihood option (Source Himalyan wild Food plant).

Active Compounds

The chemical investigation of *E hirta* has lead to the isolation of a number of active constituents, which includes flavonoids, terpenoids, phenols, essential oils and other compounds.

Among flavonoids; compounds like quercetin, quercitrin, quercitol and derivatives containing quercetin rhamnoside, a chlorophenolic acid, rutin, myricitrin, cyaniding 3, 5-diglucoside, pelargonium 3, 5-diglucoside, leucocyanidol, leucocyanidin and camphol, myrical alcohol, inositol, tetraxerol, friedelin, kaempferol and ellagic acid. (Rastogi and Mehrotra, 2002).

The essential oil extract of *E hirta* is reported to have important major constituents including 3,7,11,15-tetramethyl -2-hexadecan-1-ol, 6,10,14-trimethyl- 2-pentadecanone, phytol, n-hexadecanoic acid and hexadecanal. Besides compounds like phthalic acid, butyl tetradecyl ester, oleic acid, 1-2-benzene dicarboxylic acid etc. are among minor constituents present in essential oils. (M Ogunlesi et.al, 2009).

Among tannins, compounds like dimeric hydrolysable dehydro ellagic tannins, euphorbins A,B,C,E and terchebin, 2,4,6- tri-O-galloyl - β -D- glucose and 1,2,3,4,6,penta-o-galloyl - β -D-glucose and esters 5-O-caffeoyl quinic acid, benzyl gallate etc. are reported. (T. Yoshida et.al 1989)

Pharmacological activity

• Anti inflammatory activity

The anti inflammatory effect of ethanol extract of *E hirta* and active compounds have been studied. β -amyryn against lipopolysaccharide – activated macrophage cells. The extract and the active component inhibited nitric oxide (NO) production and i NOS gene expression .This confirms the anti inflammatory response of the plant (Mei-Fen-Shih et al, 2010).

Also, the petroleum ether, chloroform, methanol, ethanol and aqueous fruit extract of *Euphorbia hirta*, were tested for anti inflammatory activity (Prabhat Das et.al, 2010).

• Anti Allergic Activity

95% ethanolic extract prepared from whole aerial part of *Euphorbia hirta* significantly inhibited rat peritoneal mast cell degranulation and prevented eosinophill accumulation and eosinophill peroxidise activity and reduced the protein content in bronchoalveolar lavage fluid (BALF) (Singh et al. 2006). Thus *E hirta*, is claimed to possess significant activity to curb allergic reactions.

• Anti Bacterial Activity

The anti bacterial activity was tested using the methanol extract obtained from leaves of *E hirta* and examined on *Candida albicans*. The result obtained were favouring (Jackson et al.,2009). It was reported that anti microbial activity was attributed to tannins, flavonoids, alkaloids, proteins, sterol and saponin (Suresh et al.2010). The crude ethanolic extract of *E hirta* exhibited anti bacterial activity against the growth of *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Bacillus subtilis*. (Ogbulie et al., 2007). Also the anti bacterial activity of the plant extract when compared between gram positive and gram negative bacteria, the results were exhibited more promisingly in gram positive bacteria. (Nelofar et al. 2006).

• Anti Oxidant Activity

The methanolic extract of the plant expressed similar anti- oxidant activity as that of green and black tea. Lipid peroxides, hydroxyperoxides and both enzymatic and non – enzymatic anti –oxidants, express the anti oxidant potential of the leaf extract. The aqueous extract of *E hirta* showed an anti oxidant effect and a free radical scavenging activity in various in vitro models like total anti oxidant and total ferric reducing power detetermination assay for free radical- scavenging activity using ABTS, DPPH and hydroxyl radical scavenging activities at 0.25 mg/ml. (Sharma NK. et. al., 2007)

• Anti Fungal Activity

An ethanolic extract of *E hirta* showed an anti fungal activity against plant pathogens *Colletotrichum capsici*, *Aspergillus niger*, *Phomopsis caricae* – papaya, *Fusarium pallidroseum* and *Botryodiplodia*

theobromae, using paper disc diffusion technique. (Mohamed et al., 1996).

• Anti Malarial Activity

The bio assay guided fractionation of the methanolic extract of aerial parts of *E hirta* monitored against *P. Falciparum* parasites, yielded a main active chromatographic fraction showing 90% growth inhibition of *P. falciparum* at a concentration of 5µg/ml. (Koli et al., 2002).

• Anti Tumor Activity

Anti tumor activity of *E hirta* was studied Aerial parts of the plant, *E hirta* were extracted with ethanol, chloroform and petroleum ether. All the extracts showed positive result for tannin, saponin, alkaloids and flavonoids. Chloroform, ethanol extract enhanced mean survival time and reduced solid tumor mass tumor bearing mice. This anti tumor activity due to presence of flavonoids. (Sandeep et al. 2011). The mutagenic and antimutagenic activities of the aqueous and methanolic extracts and quercetin from *E. hirta* was evaluated by (Daphne et al. 2009).

Biological Properties

• Molluscicidal Activity

The latex of *E hirta* shows efficacy as plant derived molluscicides against freshwater snails. The toxic effect of binary and tertiary combinations of *Euphorbia hirta* Linn. latex powder with other plant molluscicidal compounds, were evaluated against freshwater snails *Lymnaea acuminata* and *Indoplanorbis exustus* in pond. These combinations showed significant time and dose dependent effect against both snails. (Yadav and Singh, 2007,2009,2010).

• Piscicidal Activity

Aqueous extracts of latex and stem bark of plants *E hirta* was found to have strong piscicidal activity against freshwater fish *Channa punctatus*, which was time and dose dependent and so may be used as potent eco-friendly piscicide for managing harmful fish population. (Yadav, and Singh, 2013).

• Larvicidal Activity

Larvicidal property of *Amaranthus oleracea* and *E hirta* extract against third instar larvae of *Anopheles stephensi*, malaria vector was studied. LC50 value of both plant extracts, carbon tetrachloride extract, methanol extract, petroleum ether extract, after 24 and 48hr of exposure showed a potential larvicidal property. Among the extracts, petroleum ether extract fractions were more potent compared to the other crude forms. (Preeti Sharma et al. 2009).

CONCLUSION

This review is made in attempt to provide information regarding morphology, uses, and pharmacology of *E hirta*, a herb traditionally for medicinal purposes.

Different parts of the plants including leaves stems, latex, have been analyzed to explore the wide range of active compounds present in them and their potent pharmacological effects. These compounds and the plant extract could be applied to the treatment of different diseases. Thus, *Euphorbia hirta* has great potential as a source of bioactive extracts, which may lead to development of new drugs for clinical use.

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