



# **A Comprehensive Review on Therapeutic Potential on *Euphorbia hirta* Lin**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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**Review Article**

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## **ABSTRACT**

*Euphorbia hirta* Linn, a representative of the Euphorbiaceae family, is a widespread annual herb found in wastelands in humid conditions. The plant is high in phytochemicals such as tannin, quercetin, and phytosterol, however there are few phytopharmacological investigations on it. Plant components are normally employed in traditional medicine to treat respiratory problems, gastrointestinal issues, wound healing, and other ailments. The steroid of *E. hirta* was found to have CNS depressive and muscle relaxant effects, as well as a sub-maximal anti-stress and anxiolytic impact.

**Keywords:** *Euphorbia hirta* Linn; euphorbiaceae; anxiolytic; muscle relaxant; cns depressive; phytosterol; phytomedicine.

## **1. INTRODUCTION**

According to World Health Organisation (WHO) mood disorder will be the second most major cause of ailment by 2023. Depression is characterised by a change in mood, a lack of interest in the surroundings, psychomotor

slowness, and melancholia, and is classified as an affective illness. The frequency of depression in the general population is believed to be around 5% worldwide [1].

Stress disorders are the most prevalent psychiatric diagnosis in several segments of the

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population, and they affect about 10% to 30% of the general population. Herbal products are becoming increasingly renowned [2]. Ayurveda mentions a variety of single and compound medication compositions of plant origin that are used in the treatment of psychiatric disorders [3]. Cannabis, bhrami, opium, ephedra, pilocarpus, physostigma, belladonna, datura, coffee, nuxvomica, hyoscyamus, and lobelia are only a few examples of herbal medications with powerful CNS activity [4]. Lanhers et al., 1996 investigated the benzodiazepine-like characteristics, neuroleptic, hypnotic, and antidepressant activities of a lyophilized aqueous extract of *Euphorbia hirta* L. (Eh). The results revealed that the aqueous extract does not appear to have benzodiazepine-like neuroleptic hypnotic effects. The plant extract had a direct effect on the central nervous system as well as a mild depressive effect [5]. Comprehensive knowledge and information on *Euphorbia* are included in this review for exploring the therapeutic approach of this plant by knowing its use in various medical ailments.

## 2. PHARMACOGNOSY OF *Euphorbia hirta*

### 2.1 Taxonomical Classification of *Euphorbia hirta*

**Kingdom** – Plantae

**Division** – Tracheophyta

**Class** – Magnoliopsida

**Order** – Malpighiales

**Family** – Euphorbiaceae

**Genus** – *Euphorbia*

**Species** – *Euphorbia hirta*

**Botanical Name** – *Euphorbia hirta* Linn.

**Common Name** – Asthama Plant (English), Borokeruie (Bengali)

**Synonyms** – *Euphorbia capitata* Lam, *Euphorbia pilulifera*, *Chamaesyce hirta* (L.)

### 3. MORPHOLOGY

*Euphorbia hirta* Linn, often known as Dudhi, is an annual herb that can be found in wastelands, along wall sides, and along roadsides in humid conditions. Its stem is smooth, slender, densely branched, and reddish in colour, with delicate adventitious roots emerging from nodes. From June to November the roots are thin, fibrous, and sensitive and bears flowers [6].

*E. hirta* is a member of the *Euphorbia* genus, which has a wide range of therapeutic

applications. Sweet, bitter, thermogenic, acrid, diuretic, and laxative are all characteristics of the plant [7,8]. The herb has been used as an antibiotic to treat dermatitis, snakebite, ringworms, skin irritation, and eczema since ancient times. Because the seeds and leaves are used to treat bowel disorders in youngsters, they are classified as stimulant laxatives. Antimicrobial and antiviral properties have been documented for *E. hirta* Linn. Essential oil, quercetin, phytosterols, and tannins are all said to be present in the plant [9]. So far, no significant research has been done on the plant's therapeutic potential. As a result, the current study will look at the CNS activity profile of the separated phytosterol fraction. *Euphorbia hirta* is a widespread herb found around the world, including Phillipines, Australia's Northern Territory, Africa Queensland, New South Wales, Indonesia, Central America, the Western Australia, India, and China. Originally from Central America. It is usually found standing up, reaching a height of 40cm, although it can also be found resting down, measuring roughly 1-2.5 cm in length [10].

i) **Flowers** - Male flowers are sessile, with linear bracteoles, solitary stamen, are fringed, and lack a perianth. Female flowers have a short pedicel, superior ovary, ringed perianth, three styles, three-celled, minute, and two-fid apex hairs.

ii) **Inflorescence** – Cyathium, a cyme made up of many cyathia firmly crowded together.

iii) **Fruits** – Three brown, four-sided, angular, wrinkled seeds, base truncate, hairy, 1-2mm in diameter, contained in yellow, three lobed, three seeded, keeled capsules [11-13].

iv) **Seeds**: Oblong, four-sided, pinkish brown, without caruncle, slightly wrinkled.

v) **Stems** - Small, glabrous, hairy stems & possesses 2-3 internodes.

vi) **Roots** – The roots of the plant are arranged in a taproot system manner.

### 3.1 Chemical Constituents

Many scholars have explored *E. hirta*, and a number of active components have been found. The methanolic extract of *E. hirta* was used to isolate quercitrin, Afzelin, and myricitrin [14]. Quercitrin, rutin, 2, 4, 6-tri-O-galloyl—d-glucose, euphorbin-A, euphorbin-B, euphorbin-C,

euphorbin-D, 1, 3, 4, 6-tetra-O-galloyl—d-glucose, kaempferol, protocatechuic acid, and gallic acid have all been recovered from *E. hirta* [15-16] *E. hirta* also contains tinyatoxin, choline, shikmic acid, quercitol, and camphol derivatives comprising chtolphenolic acid and rhamnose [17], as well as 24-methylenecycloartenol, -amyrin, -sitosterol, nnonacosane, heptacosane [18], tinyatoxin, choline, shikmic acid, quercitol and camphol derivatives containing chtolphenolic acid and rhamnose [18].

### 3.2 Traditional Uses

The plant is used to treat a variety of ailments, including respiratory diseases (cough, cold, asthma, bronchitis, hay fever, emphysema), gastro intestinal disorders (constipation, dysentery, bowel complaints, digestive problems), genital apparatus (metrorrhagic, agalactosis, gonorrhoea, urethritis), urinary

apparatus (diuretic, urethritis), and In South India, it's utilised for ear drops as well as the treatment of boils and ulcers [19]. The therapeutic uses of the plant are mentioned below, classified by plant part and kind of extract, for a variety of medical conditions.

## 4. PHARMACOLOGICAL ACTIVITIES BASED ON EVIDENCES

### 4.1 Anti-inflammatory Properties

Mei-Fen Shih et al. (2010) evaluated the anti-inflammatory properties of an ethanol extract of *Euphorbia hirta* (Eh) and its active component - amyryn in LPS-activated macrophage cells (RAW 264.7). iNOS gene expression and nitric oxide (NO) creation were both reduced by the extract and active component. As a result, *Euphorbia hirta* and -amyryn could be used to treat arthritis inflammation [20].



i) Whole Plant

ii) Stem

iii) Roots



iv) Inflorescence

Fig. 1. Classification of *Euphorbia hirta*

**Chart 1. Therapeutic uses of the plant**

S.no	Plant part & extract used	Therapeutic Use	Reference
1.	Aqueous extract of leaves	Anti-diarrheal, Spasmogenic, Anti-amoebiasis	Hore et al., 2006
2.	Methanol, chloroform, ethanol, Petroleum & ether extract of fruits	Anti-inflammatory	Mei-Fen Shih et al. 2010
3.	Aqueous & ethanolic extract of leaves	Anti-diuretic	
4.	Aqueous & methanolic extract of whole plant	Anti-oxidant	Abu et al. 2011
5.	Ethanolic & ethyl acetate extract of whole plant & of fruits	Anti-diabetic	Kumar et al. [19]
6.	Lyophilised extract of whole plant	Anti-thrombocytopenic	Joveneio et al. 2012
7.	Aqueous & methanolic decoction of leaves	Anti-viral	Agnes et al. 2009
8.	Aqueous extract of whole plant	Anthelmintic, Molluscicidal and Larvicidal	Preeti et al; 2009
9.	Dried whole plant powder	Galactogenic	Blanc et al. 1964
10.	Hydroalcoholic decoction of whole plant	Hepatoprotective	Tiwari et al. 2015

**Chart 2. Pharmacological activities of the plant**

S.no	Activities	References
1.	Anti-inflammatory	Mei-Fen Shih et al. 2010
2.	Anti-diabetic	Kumar et al. [19]
3.	Anti-tumor	Shao-Ming Chi et al. [21]
4.	Anti-depressant	Lanhers et al. [4]
5.	Anti-diahearral	Hore et al. 2006
6.	Anti-microbial - antifungal	Ghosh et al. [22]
7.	Immunomodulatory	Ping et al. 2012
8.	Anti-allergic, anti – anaphylactic	Yossouf et al. 2007 & Singh et al. [23]
9.	Anxiolytic & sedative	Anuradha et al. 2008 & Lanhers et al. 1990
10.	Anti-oxidant	Abu et al. 2011
11.	Antiasthmatic	Ekpo et al. 2007
12.	Anticancer	Patil et al. 2011

#### 4.2 Anti-diabetic Effects

Kumar et al. [19] investigated the anti-diabetic effect of *Euphorbia hirta* leaf, stem, and flower ethanolic extracts (250 and 500 mg/kg) in normal and streptozotocin-induced diabetic mice. The extracts were taken orally for 21 days and showed a significant reduction in blood glucose levels. *E. hirta* was found to have anti-diabetic properties in the study [24].

#### 4.3 Anti-tumour Activity

A cyclopentanone derivative (1'R,5'R)-5-(5'-carboxymethyl-2'-oxocyclopentyl)-3Z-pentenyl acetate was obtained from *Euphorbia hirta* by Shao-Ming Chi et al. [21]. The structure was determined using spectroscopic analysis and 1D and 2D NMR. A549 (lung cancer) and K562 (human leukaemia) cell lines were used to test the cytotoxicity of ethanol extract. The ethanol extract had a poor action against A549 cells

(inhibition ratio 15.02 11.60 percent) and was inert against K562 cells, according to the data [25].

#### 4.4 Anti-depressant Activity

Lanhers et al. [5] assessed the benzodiazepine-like characteristics, neuroleptic, hypnotic, and antidepressant activities of a lyophilized aqueous extract of *Euphorbia hirta* L. (Eh). The results revealed that the aqueous extract does not appear to have benzodiazepine-like neuroleptic hypnotic effects. The plant extract had a direct effect on the central nervous system as well as a mild depressive effect

#### 4.5 GI Tract

Hore et al. (2006) analyzed gastrointestinal motility in rats and mice. According to the findings, aqueous leaf extract reduced gastrointestinal motility in rats and Castrol oil-

induced diarrhoea in mice in a dose-dependent and substantial manner. These findings backed up the usage of *Euphorbia hirta* for diarrhoea in the past [26].

#### 4.6 Anti-microbial & Anti-fungal

Ghosh et al. [22] assessed the antimicrobial activities of an ethanol extract of *Euphorbia hirta* against the growth of *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Bacillus subtilis*.

#### 4.7 Immunomodulatory

Ping et al. (2012) investigated the effect of a plant methanolic extract, which was found to have 45 percent immunomodulation characteristics by preventing NO generation. The methanolic extract of *Euphorbia hirta* (1 mg/ml) has outstanding mutagenic and mitodepressive effects.

#### 4.8 Anti-allergic, anti – anaphylactic

Yossouf et al., 2007; and Singh et al. [23] *Euphorbia hirta* ethanol extract was found to have antianaphylactic effects. In a study, the herb was found to prevent passive cutaneous anaphylaxis in rats and active paw anaphylaxis in mice.

#### 4.9 Anxiolytic & Sedative

The hydroalcoholic extract of the plant was tested for anxiolytic effects in chronically stressed rats by Anuradha et al. (2008) and Lanhers et al. (1990). The findings show that *Euphorbia hirta* has anxiolytic properties, particularly in CIS-induced anxiety.

#### 4.10 Anti-oxidant

Abu et al. (2011) investigated the anti-oxidant properties of plant extracts from various sections of the plant and found that leaves extract had the highest DPPH scavenging activity of 72 percent, followed by the scavenging effects of the other plant parts.

#### 4.11 Antiasthamatic

Ekpo et al. (2007) explored the role of plant extract in asthmatic mice and found that the findings were positive when compared to the

ultrastructure of fibrin networks and platelets in control animals.

#### 4.12 Anticancer

Patil et al. (2011) investigated the cytotoxicity of *Euphorbia hirta* in a brine ship lethality test and found that the LC50 of ethyl acetate and acetone decoction of plant parts, respectively, were 71.15 and 92.15 g/ml.

### 5. CONCLUSION

In this review of *E. hirta* a detailed description of morphological account, chemical constituents, it's traditional uses and potential for showing various activities like anti-inflammatory, anti-diabetic, anti-tumor, anti-depressant, anti-diahearral, anti-microbial, antifungal, immunomodulatory, anti-allergic, anti-anaphylactic, anxiolytic & sedative, anti-oxidant, antiasthamatic, anticancer were described. Further research should be carried in support with this to explore the new avenues of it.

### CONSENT

It is not applicable.

### ETHICAL APPROVAL

It is not applicable.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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