



A Review- Pharmacology and therapeutic potential of *Euphorbia hirta* (Syn: *Euphorbia pilulifera*)

Mr Deep Amit Shinde*1, Dr. Dhambore Bhagyashree Ramdas*2 Dr Naikwadi

College of Pharmacy Jamgaon, Tal-Sinnar Dist. Nashik 422103

ABSTRACT:

The phytochemical screening of *Euphorbia hirta* revealed that the plant contained reducing sugars, steroids, terpenoids, alkaloids, proteins, fats, oils, gums, and mucilages, saponin, glycoside, and coumarin, cardiac glycosides, anthroquinones, flavanoids and phenolic compounds. The previous pharmacological studies showed that *Euphorbia hirta* exerted antioxidant, antimicrobial, analgesic, antipyretic, sedative, anxiolytic, antiepileptic, anti-inflammatory, and anxiolytic antihistaminic, antiasthmatic, diuretic, anticancer, anti-diabetes, wound healing, gastrointestinal, antiparasitic, immunological, hepatoprotective, angiotensin-converting galactogenic enzyme inhibiting and anti-dipsogenic activities. The current review discussed the chemical constituents, pharmacological and therapeutic potential of *Euphorbia hirta*.

Keywords: *Euphorbia hirta*, chemical content, pharmacology, therapeutic potential

1. INTRODUCTION

India has tremendous wealth of aromatic and medicinal plants. In current days medicinal plants play a key role as pillar of traditional healthcare systems of medicine in many developing countries. Since ancient times, numerous medications have been developed with the bioactive compounds present in these medicinal plants. According to World health organization (WHO) more than 80% world's population depends on medicines derived from these medicinal plants for primary health care needs. The use of medicinal plants as a source for relief from illness can be traced back over since before recorded history. These phytomedicines are safe and environment friendly. Phytomedicines have become their use is widespread and is growing in popularity. Plants produce a varied range of bioactive molecules these are called phytochemicals; Phytochemicals are bioactive chemicals of plant origin. They are regarded as secondary metabolites because the plants that make them may have little need for them. [10]



Fig 1: Euphorbia hirta



Fig 2: Euphorbia hirta

Taxonomical classification:

Kingdom: Plantae

Subkingdom: Viridaeplantae

Infrakingdom: Straptophyta

Division: Tracheophyta

Subdivision: Spermatophytina

Infradivision: Angiosperms

Class: Magnoliopsida

Superorder: Rosanae

Order: Malpighiales

Family: Euphorbiaceae

Genus: Euphorbia

Species: Euphorbia hirta (Euphorbia pilulifera)

Vernacular Names:

Awuna- Akinkodze

Bengal -Barokhervi

English- Pill---bearing spurge, asthma herb, snakeweed

Gujarat- Dudeli

Hindi- Dudhi

Indonesia- Daun biji kacang, patikan kebo

Sanskrit-Amampatchairaisi, barokheruie, dugadhika

Tamil -Amumpatchaiyarissi

Telagu -Reddinanabrolu, bidarie, nanabala, nanabiyan

Visayan- Bovi, buyayava

Malayalam- Nelapalai

Malaysia- Ambin janyan, kelusan, keremak susu

Marathi -Dudnali, govardhan

Orissa- Jhotikhuntian

Traditional uses:

Plants have traditionally been used to treat a variety of conditions, including digestive disorders (intestinal parasitosis, dysentery, bowel problems, digestive issues, and respiratory problems). diseases (cough, cold, asthma, bronchitis, hay fever, emphysema), urinary apparatus (diuretic, kidney stones), genital apparatus (metrorrhagic, agalactosis, gonorrhoea, urethritis), various ocular ailments (conjunctivitis, corneal ulcer), skin and mucous membranes problems (guinea worm, scabies, tinea, trush, aphtha) and tumour. In south india, it is used as ear drops are used to treat cuts, boils, and other wounds. The latex of the plant is often used as warts and cuts to prevent pathogen infection. A decoction of leaves induces milk flow and the leaf chewed with palm kernel for restoration of virility. It is also effective in treating ulcers. The plant is also eaten as vegetables.

Physical and chemical properties:

Total ash: 8.90, acid insoluble ash 7.84, water soluble ash 1.06, water soluble extract 7.0, ethanol soluble extract 14.85, methanol soluble extract 9.71 and moisture content 9.84 (% w/w). However, moisture ash content of leaves 18.66 and stems 21.50 (percent W/W), with leaves containing 13.50 and stems containing 10.30 (percent W/W). Acid-insoluble ash of the leaves is 3.50 and ash of the stems is 2.50 (% W/W), and protein of the leaves is 9.5 and protein of the stems is 3.0 (% W/W), fat of the leaves 25.0 and stems 14.0 (% W/W) and carbohydrate of the leaves 1.5 and stems 8.0(%W/W). The diphenyl-1-picrylhydrazyl (DPPH) assay and the reducing power by cyanoferrate method were used to investigate the antioxidant properties of Euphorbia hirta's various parts (leaves, stems, flowers, and roots). The leaves extract exhibited a maximum DPPH scavenging activity of (72.96±0.78) % followed by the flowers, roots and stems whose

scavenging activities were (52.45 ± 0.66) %, (48.59 ± 0.97) %, and (44.42 ± 0.94) %, respectively. The standard The IC₅₀ for leaves, flowers, roots, stems and BHT were 0.803, 0.972, 0.989, 1.358 and 0.794 mg/ml, respectively. [8]

2. CHEMICAL CONSTITUENTS:

Phytochemical screening of *Euphorbia hirta* leaf extract revealed the presence of reducing sugars, proteins, fats, oils, terpenoids, alkaloids, steroids, tannins, gums, mucilages, glycoside, saponin, coumarin, flavanoids, anthroquinones, cardiac glycosides, and phenolic compounds. Myricitrin, afzelin, and quercitrin, 1,3,4,6-tri-O-galloyl--d-glucose, rutin, quercitin, euphorbin-A, euphorbin-B, euphorbin-C, and euphorbin-D tetra-O-galloyl--d-glucose, kaempferol, gallic acid, and protocatechuic acid were isolated from the aerial parts from *Euphorbia hirta*. The leaves of *Euphorbia hirta* have yielded six compounds that identified as gallic acid, quercitrin, myricitriu, 3,4-di-O-galloylquinic acid, 2,4,6-tri-O-galloyl-D-glucose and 6,-penta-O-galloyl-beta-D-glucose Leucocyanidol, camphol, euphorbianin, euphorbins A-E, and triterpenes: α -amyrin, 24-methylencycloartenol and -sitosterol were isolated from *Euphorbia hirta*. Seven phenolic compounds, including (-)-epigallocatechin gallate (16.25-29.52 mg/100 g dw), 16.72-41.87 mg/100 g dw, 5.24-98.83 mg/100 g dw, and 12.30-51.87 mg/100 g dw of isoquercitrin g dw, syringic 51.14-68.00 mg/100 g dw, chlorogenic 48.68-79.67 mg/100 g dw and caffeic acids 0.66-1.22 mg/100 g dw], and six sterols [-sitosterol-D-glucoside 19.08- 45.76 mg/100 g dw, -sitosterol 1.20-3.56mg/100 g dw, cholesterol 0.41-3.36 mg/100 g dw, brassicasterol 10.09-32.57mg/100 g dw, campesterol undetected -0.51 mg/100 g dw, stigmasterol 11.69-19.66 mg/100 g dw] were isolated from *Euphorbia hirta*. The total phenolic and flavonoids content of different parts (leaves, stems, flowers and roots) of *Euphorbia hirta* were determined. The extract of the leaves contained the most total phenolics, or (206.171.95) mg. GAE/g], followed by flowers, roots and stems extracts which contained (117.08 ± 3.10) mg GAE/g, (83.15 ± 1.19) mg GAE/g, and (65.70 ± 1.72) mg GAE/g, respectively. The leaves also had the highest total flavonoids content value $[(37.970 \pm 0.003)$ mg CEQ/g], followed by flowers, roots and stems extracts which contained (35.200 ± 0.002) , (24.350 ± 0.006) , and (24.120 ± 0.004) mg CEQ/g, respectively. Ten compounds were identified from the methanolic leaf extract of *Euphorbia hirta* including methyl 14-methylpentadecanoate, S-methyl-L-cysteine, 2-amino-3-sulfanylpropanoic acid, palmitic acid, and 5-methyl-1,3-oxazolidin-2-one chloromorpholin-4-ium, 2,3,5-trimethyl-1 H-pyrrole; niacin or nicotinic acid, 4-amino-4-oxobut-2-enoic acid and 17-carboxyheptadec-9-en-1- ylium. Triterpenoids: α -amyrin, -amyrin, taraxerone, taxerol, -amyrin acetate, taraxerone, 11 α , 12 α -oxidotaraxerol, and tannins were identified in *Euphorbia hirta*. The substance Ca was 1.1%, P was 0.3 percent, Fe was 0.03%, Mg was 0.5 percent, Mn was 0.01%, Zn was 0.01%, and Cu: 0.002%.

3. PHARMACOLOGICAL ACTIVITIES

1. Antifungal and antibacterial properties:

Chinwe et al., 2012 isolated Gram-positive staphylococcus aureus, and Gram negative Escherichia coli, Salmonella typhi, from degenerated wound, stool and a high vaginal swab. Total dehydrogenase activity assayed using 2,3,5-triphenyl tetrazolium chloride (TTC), ethanolic *Euphorbia hyssopifolia* and *Euphorbia hirta* inhibitory activity compared with gentamycin and ciprofloxacin, two common antibiotics. There was a dose-dependent inhibition. observed.

Euphorbia hyssopifolia effective against gram-positive staphylococcus aureus, than gram-negative salmonella typhi and *Escherichia coli*. *Euphorbia hirta* effective against Gram-negative salmonella typhi and *Escherichia coli*, but not effective against staphylococcus aureus. Hence, *Euphorbia hirta* can be implicated against typhoid fever and urinary tract infections. [6]

2. Anti-allergic properties:

The ethanolic extract of *E. hirta* was found to possess a prominent anti-anaphylactic activity. *E. hirta* prevented passive cutaneous anaphylaxis (PCA) in rat and active paw anaphylaxis in mice. The suppressive effect of *E. hirta* was observed on the release of TNF- α and IL-6 from rat peritoneal mast cells were activated by anti-DNP-HAS. The findings of the current study prominently validate the traditional use of *E. hirta* as a herbal drug against Type I disorders caused by allergies [Yousouf et al., 2007]. The current study demonstrated that 90% of the ethanolic extract from the whole aerial parts of *E. hirta* possessed significant activity to prevent allergic reactions in their early and late stages caused by antihistaminic, antiinflammatory, and immunosuppressive properties. Moreover, the ethanolic extract of *E. hirta* can prevent and treat rat anaphylactic. [7]

3. Anti-diarrheal Property and Spasmogenic :

The water extract of the plant is prominently and dose-dependently decreased the gastro-intestinal motility in normal rats and reduced the influence of Mice with castor oil-induced diarrhea. The water extract of *Euphorbia hirta* exhibited anti-diarrheal, anti-microbial, anti-amoebic, and anti-tetanic properties. A study discussed the contractile activity of the total aqueous extract of leaves in rats. The result concluded that water extracts had spasmogenic activity in vitro and anti diarrheal activity in vivo. [4]

4. Anti-inflammatory Property:

Mei-Fen Shih et al., 2010 studied anti-inflammatory effect of ethanol extract of *Euphorbia hirta* (Eh) and active component β -amyrin against lipopolysaccharide (LPS) – activated macrophage cells (RAW 264.7). The extract and active component inhibited nitric oxide (NO) production and iNOS gene expression. Therefore, *Euphorbia hirta* and β -amyrin had potential arthritis inflammation treatment. Prabhat Das et al., 2010 carried out an carragenan induced inflammation model. Diclofenac sodium 50mg/kg served as reference standard. The petroleum ether, chloroform, methanol, ethanol and aqueous fruit extracts of *Euphorbia hirta* were tested for anti-inflammatory activity. When compared to the other extracts, the aqueous and ethanol extracts provided the greatest level of protection against inflammation. As a result, experimentally induced inflammation in rats is reduced and prevented by the plant *Euphorbia hirta*. [6]

5. Diuretic Property :

Using rats, the diuretic effect of *E. hirta* leaf extracts was evaluated. acetazolamide and furosemide as standard diuretic drugs. The water and ethanol extracts (50 and 100 mg/kg) of the plant produced time-dependent increase in urine output. Electrolyte excretion was also significantly affected by the plant extracts. This study suggests that the active ingredient(s) in the *E. hirta* leaf water extract were comparable diuretic spectrum to that of acetazolamide. These results validate the traditional use of *E. hirta* as a diuretic agent by the Swahilis and Sukumas. [2]

6. Anti-oxidant Quality:

The antioxidant activities of different parts (leaves, stems, flowers and roots) of *Euphorbia hirta* were studied by diphenyl-1-picrylhydrazyl (DPPH) assay and reducing power by cyanoferrate method. The branches extract exhibited a maximum DPPH scavenging activity of $(72.96 \pm 0.78)\%$ followed by the flowers, roots and stems whose scavenging activities were $(52.45 \pm 0.66)\%$, $(48.59 \pm 0.97)\%$, and $(44.42 \pm 0.94)\%$, respectively. The BHT had an IC₅₀ of 0.803, 0.972, 0.989, 1.358, and 0.794 mg/ml in its leaves, flowers, roots, and stems, respectively. The reducing power of the leaves extract was comparable with that of ascorbic acid and found to be dose dependent. [8]

7. Anti-tumor Property :

Antitumour activity: Before starting experiment the total cell count of the cancer cell The suspension was weighed. Five Swiss albino mice were used in each group to induce the solid tumors. by injecting EL4 cells (1×10^6 cells per animal) subcutaneously. After the tumor inoculation the dose of 200mg/kg of pet ether, chloroform and ethanolic extract of aerial part of *Euphorbia hirta* L. were administered orally 24 hr. every day for 10 day [17]. Similarly standard 5-fluorouracil (20mg/kg) was administered orally 24 h after the tumor inoculation everyday for 10 days. The volume of tumor was measured every third day for 1 month. The solid tumor development was measured with the Vernier Caliper and calculated using the formula, $V = \frac{4}{3} \times \pi \times r_1 \times r_2 \times r_3$. where V is the volume expressed as mm³ and r₁, r₂, and r₃ are the radii in two directions. [3]

8. Anxiolytic and Sedative Effect:

The hydroalcoholic extract of the plant was investigated for anxiolytic effects in chronically stressed rats, and it was observed in two different stressors: Chronic immobilization causes stress (CIS) and swim stress (FSS). The conclusions demonstrate the ability to reduce anxiety with *Euphorbia hirta*, particularly in CIS induced anxiety. Another study showed the behavioral effects of the extract in mice. Lyophilised water extract does not show any mortality when administered orally. [5]

9. Anti-hypertensive / ACE inhibition Effect :

Angiotensin-converting enzyme inhibition and anti-dipsogenic activities of *E. hirta* extracts: The current study showed that the extract from leaves and stems of *E. hirta* inhibited angiotensin-converting enzyme's activity (ACE). [7]

10. Wound healing Property

A study was done to observe anti bacterial activity and tissue reaction of ethanolic decoction of the plant in infected canine wounds. The ethanolic extract had a positive effect on *Staphylococcus aureus* growth in the canine wound, but the extract had not provoked cutaneous tissue reaction in canine wounds. Another study showed that ethanolic extract of the whole plant in animals has significant burn wound healing properties. [4]

11. Gastro-intestinal Tract Effect:

A research study was carried out to investigate the gastro-intestinal motility in animals. The findings demonstrated that water extract of leaves was significantly and dose dependently decreased gastro-intestinal rat motility and Castrol oil-induced motility mice with diarrhea. [4]

12. Anti-cancer Property

Brine shrimp lethality test was used to investigate the cytotoxicity of *Euphorbia hirta*. The study concluded that the LC₅₀ of ethyl acetate and acetone plant decoction parts were 71.15 and 92.15 µg/ml, respectively. Another study showed that flavonol glycosides (afzelin, quercitrin, and myricitrin) was isolated and characterized from the leaf's methanol-based decoction and stem of the plant and it was showed a slight cytotoxic effect against human epidermoid carcinoma KB 3-1 cells. The leaves decoction of the plant also showed toxicity based on the viability of the cells by in vitro screening on the lymphocytes from the cells in blood. [4]

13. Sperm Motility Effect:

A research study utilized sexually matured and healthy West African Dwarf rams. The conclusion suggests fertilization spermatozoa's capacity and livability were negatively affected. [4]

14. Anti-diabetic effects:

Ethanollic extracts of the leaves, flowers, and stems of *Euphorbia hirta* (250 and 500 mg/kg) to measure the antidiabetic effect against both streptozotocin-induced and normal blood sugar levels. diabetic mice. Oral administration of the extracts for 21 days showed significant reduction in blood glucose level. The study showed that *E. hirta* has antidiabetic action. Rashmi et al. (2010) looked into how *Euphorbia hirta* leaf extracts affected diarrhoea in normal and alloxan-induced diabetic mice. Petroleum ether and ethanolic extracts of leaves were orally tested at doses of 250 and 500 mg/kg body weight for 21 days in normal and alloxan induced mice and blood glucose level was measured with glucometer. Oral administration of the both extracts significantly decreased blood glucose level.[1]

Conclusion:

The current paper reviewed the chemical constituent, pharmacological and therapeutic potential of *Euphorbia hirta* as promising herbal drug because of its safety and effectiveness.

REFERENCES:

1. Mukesh chaudhary, pharmacology of *euphorbia hirta*: An overview, word journal of pharmacy and pharmaceutical sciences, 9(8) 1462-1474, 2020.
2. Sandeep B. patil, chandrakant S. magdum, Review of phytochemistry and pharmacological Aspects of *euphorbia Hirtalinn*, JPRHC, 1(1), 113-133, 2009
3. sandeep B. Patil, and chandrakant S. magdum, Phytochemical investigation and antitumor activity of *euphorbia hirta linn*, European Journal of experimental Biology, 1(1),51-56,2011.
4. Pranobesh Ghosh, Shaktijit das, suprodip mandal Botanical Derception, phytochemical constituents and pharmacological properties of *euphorbia nirta linn*: A review, International Journal of Health Sciences and Research 9(3), 2019
5. Amrendra Nath Tripathi, Suresh Chandra Sati, Parikshit Kumar, *Euphorbia Hirta Linn - An Invasive Plant: A Review of Its Traditional Uses, Phytochemistry and Pharmacological Properties*, International Journal of pharmaceutical sciences and Research, 12(12),6189-6201,2021

6. Asha.S, Deevika.B, Mohamad Sadiq.A, Euphorbia Hirta linn- A Review on traditional uses phytochemistry and pharmacology, world Journal of pharmaceutical Research 3(4), 180-205, 2014
7. Shilin chen, linfang huang, Meihua yang, Euphorbia hirta (feiyangcao): A review on its ethnopharmacology, phytochemistry and pharmacology, journal of medicinal plants research, vol. 6(39) 5176-5185, 2012.
8. Prof Dr. Ali Esmail Al-snafi, pharmacology and therapeutic potential of Euphorbia hirta (syn: Euphorbia pilulifera) A review, IOSR journal of pharmacy, 7(3), 07-20, 2017.
9. Sunil kumar, Rashmi malhotra, Euphorbia Hirta: Its chemistry, traditional and Medicinal uses, and pharmacological activities, 4 (7), 2010.
10. Waseem Ahmad, Shilpa Singh, Sanjay kumar, Phytochemical Screening and antimicrobial study of Euphorbia hirta extracts, Journal of medicinal plants studies, 5(2), 183-186, 2017.

