

A COMPENDIUM ETHNOPHARMACEUTICAL REVIEW ON *Euphorbia hirta* L.

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Abstract

Euphorbia hirta Linn. is a common herb belonging to the family Euphorbiaceae, which is frequently seen everywhere in Bangladesh. Though almost all of its parts are used in traditional systems of medicines, aerial parts and leaves are the most important parts which are used medicinally. It is used in different systems of medicine in the treatment of diarrhoea, bronchitis, skin diseases, fever, analgesic, gastrointestinal disorders, vomiting, wound healing, respiratory diseases, pulmonary disorders etc. The plant has been used as antimicrobial, anti-inflammatory, anti-tumor, antiamoebic, antifertility, antimalarial, antioxidant, sedative, cytotoxic, aflatoxin inhibition, larvicidal, immunomodulatory and so on. The aim of current ethnopharmaceutical documentation on this medicinal plant was to pile up the enormous amount of fresh information of scientific research and reports available in different aspects that proves its involvement in pharmacology. This update review also includes reports on taxonomy, morphology, monographs, distribution, phytochemistry and traditional medicinal uses of the plant.

Key Words: *Euphorbia hirta*; Ethnopharmaceutical; Pharmacology; Phytochemistry; Traditional use.

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INTRODUCTION

Infectious diseases are major causes of morbidity and mortality in the developing world and accounts for about 50% of all deaths. In Bangladesh, about 17% of all children admitted to the pediatric wards die of diarrhea.^[1] Some 5.8 million deaths each year in infants and children below 5 years are caused by enteric diseases worldwide.^[1] In many parts of the world, there is a rich tradition in the use of herbal medicine for the treatment of many infectious diseases.^{[2][3]} In developing countries, it is estimated that about 80% of the population rely on traditional medicine for their primary health care.^{[4][3][5]} Most of the pathogens causing enteric infections have developed resistance to the commonly prescribed antibiotics. Bacterial resistance to antibiotics increases mortality, likelihood of hospitalization and the length of stay in the hospital.^[1] Therefore, the demand for new and effective anti-microbial agents with broad-spectrum of activity from natural sources is increasing day by day.^{[6][7]}

E. hirta L. is one of such herbs belonging to the family Euphorbiaceae which is frequently seen occupying open waste spaces and grasslands, road sides, and pathways in many parts of the world.^{[1][8][9]} The leaves of *E. hirta* are found to contain flavonoids, polyphenols, tannins, sterols, alkaloids, glycosides and triterpenoids.^{[9][10]} The plant has a reputation for increasing milk flow in women because of its milky latex and is used for other female complaints as well as diseases like bronchitis, asthma, eczema, dysentery. It is used as antidiarrheal, antispasmodic, anti-inflammatory, antifungal, anticancer, antimalarial, antiamebic, antibacterial and antihelminthic etc. The present investigation was carried out to compile the medicinal properties of different plant parts of *E. hirta* L. and to compare their traditional uses with scientific evidences.

Taxonomy of *Euphorbia hirta*

The botanical classification of *Euphorbia hirta* is as following

Kingdom : Plantae
Phylum : Magnoliophyta
Class : Angiospermae
Order : Malpighiales
Family : Euphorbiaceae
Genus : *Euphorbia*
Species : *hirta*

Plant parts used

The whole plant is used; especially aerial parts and leaves are commonly used.

Monograph

Bengali Names: Barokhervi
 English Names: bearing spurge, asthma herb, snakeweed
 Scientific Name: *Euphorbia hirta* Linn.
 Family: Euphorbiaceae
 Duration: Annual
 Growth Habit: Multi-branched herb^[9]
 Bangladesh Nativity: Native

Morphology

E. hirta belongs to the plant family Euphorbiaceae and genus Euphorbia. It is a slender-stemmed, annual hairy plant with many branches from the base to top, spreading up to 40 cm in height, reddish or purplish in color. Leaves are opposite, elliptic - oblong to oblong-lanceolate, acute or subacute, dark green above; pale beneath, 1- 2.5 cm long, blotched with purple in the middle, and toothed at the edge. The fruits are yellow, three-celled, hairy, keeled capsules, 1-2 mm in diameter, containing three brown, four-sided, angular, wrinkled seeds.^{[1][9][11][12][13][14][15]}

Table 1: Chemical constituents of *E. hirta*

Parts used	Constituents	References
Whole plant	Afzelin, quercitrin, myricitrin, rutin, quercitin, euphorbin-A, euphorbin-B, euphorbin-C, euphorbin-D, 2, 4, 6-tri- <i>O</i> -galloyl- β -d-glucose, 1, 3, 4, 6-tetra- <i>O</i> -galloyl- β -d-glucose, kaempferol, gallic acid, protocatechuic acid, β -amyrin, 24-methylenecycloartenol, β -sitosterol, heptacosane, nonacosane, shikmic acid, tinyatoxin, choline, camphol, rhamnase and chtolphenolic acid	[9][12][16][17][18]
Leaves	Flavonoids, polyphenols, tannins, sterols, alkaloids, glycosides and triterpenoides	[3][10]

Table 2: Folk remedies and traditional uses of *E. hirta*

Type of use	Symptoms	Part used and method	References
Gastrointestinal Disorders	Diarrhea, dysentery, intestinal parasitosis	-	[1][9] [19][20]
Bronchial and respiratory diseases	Asthma, bronchitis, hay fever	-	[1][9] [21][20]
Conjunctivitis	-	-	[9]
Hypotensive and tonic properties	-	-	[9]
Anxiolytic, analgesic, antipyretic, and anti-inflammatory activities	-	Aqueous extract	[9]
Eyelid styes	-	The stem sap	[9]
Swelling and boils	-	Leaf poultice	[1][9][20]
Antifungal and antibacterial activities	-	Methanolic extract of leaves	[9]
Itchy sole	-	Leaves pounded with turmeric and coconut oil	[9]
Eye sores	-	Latex	[1][9][20]
Skin diseases	-	Decoction of dry herbs	[1][9][12][20]
Thrush	-	Decoction of fresh herbs	[1][9][12][20]
Mothers deficient in milk	-	Root decoction	[9][12]
Snake bites	-	Roots	[9][12]
Antispasmodic activity	-	Polyphenolic extrac	[9][22]
Wound infections	-	Decoction of the herb	[1][20]
Vomiting, fever, bronchitis and pulmonary disorders	-	Decoction of the herb	[1][23]
Eye and ear infections	-	Exudates of the stem	[1][24]
Athletes foot and scorpion bite pains	-	Decoction of the plant	[1][20][23]

Distribution

E. hirta is distributed throughout the hotter parts of Bangladesh, India and Australia, often found in waste places along the roadsides.^{[16][9]} It is widely distributed all over the world.^[15]

Phytochemistry

The whole plant contains quercitrin, myricitrin, shikmic acid, tinyatoxin and choline. Other constituents of the whole plant are euphorbin-ABCD, 2, 4, 6-tri-*O*-galloyl- β -

d-glucose, 1, 3, 4, 6-tetra-*O*-galloyl- β -d-glucose, kaempferol, gallic acid, protocatechuic acid, β -amyrin, 24-methylenecycloartenol β -sitosterol etc. Leaf of plant contains flavonoids, tannins, sterols, alkaloids etc. The major constituents of various plant parts are shown in Table1.

Folk remedies and traditional uses

E. hirta is a very popular herb amongst practitioners of traditional medicine and the herb is widely used in traditional medicine to

Table 3: Pharmacological activities of *E. hirta*

Pharmacological activity	Plant parts and methods used	Organisms	References
Antibacterial activity	Ethanollic extract of aerial parts, methanollic extracts of leaves, flowers, stems and roots	<i>E. coli</i> , <i>S. aureus</i> , <i>P. vulgaris</i> , <i>P. aeruginosa</i> , <i>S. typhi</i> , <i>Micrococcus</i> sp., <i>K. pneumonia</i> , <i>P. aeruginosa</i> , <i>P. mirabilis</i> , <i>B. cereus</i> , <i>B. subtilis</i> and <i>B. thuringensis</i>	[20][25][26] [3][9][15] [27][28][29] [30][31]
	Aqueous and chloroform leaf extracts	<i>K. pneumonia</i>	[9][15]
Antimalarial activity	Methanollic extract of aerial parts	<i>P. falciparum</i>	[9][18][31][32]
Anti-inflammatory activity	<i>N</i> -hexane extract of aerial parts	Mice, rat	[9][31][33][34]
Galactogenic activity	Powdered <i>E. Hirta</i>	Guinea pig	[9][35]
Antiasthmatic activity	-	-	[9][21]
Effect on urine output and electrolytes	Ethanollic and aqueous leaf extracts	Rat	[9][36]
Antidiarrheal activity	Herb decoction, aqueous leaf extract	Mice, rat	[9][19][25] [31][37]
Antioxidant activity	Aqueous extract	-	[9][38]
Antifertility activity	-	-	[9]
Antiamoebic activity	Polyphenolic extract	<i>E. histolytica</i>	[9][25][31]
Antifungal activity	Ethanollic extract	<i>C. capsici</i> , <i>C. albicans</i> , <i>F. pallidoroseum</i> , <i>B. theobromae</i> , <i>P. caricae-papayae</i> , <i>A. niger</i> , <i>A. fumigatus</i> , <i>A. flavus</i> , and <i>R. oryzae</i> .	[9][15][27] [29][30][31]
Acute toxicity effect	Leaves and stems	Mice and <i>A. salina</i>	[39]
Sedative effects	Aqueous extract	Mice	[40]
Anxiolytic properties	Aqueous extract	Mice	[40]
Deleterious effects on the serum Chemistry	-	Rat	[41]
Anti-allergic activity	Ethanollic extract of whole aerial parts	Rat and mice	[31][42][43]
Antitetanitic properties	Water extract	-	[25][31]
Diuretic activity	Ethanollic and aqueous leaf extracts	Rat	[36][31]
Antioxidant activity	Methanol and water extracts of leaves, stems, flowers, and roots	-	[31][44][45][46]
Anti-tumor activity	Methanol extract of the leaves and aerial part	Swiss albino mice, hep-2 cells from human epithelioma of the larynx	[31][47][48][49]
Anti-diabetic activity	Ethanol and ethyl acetate Extracts of leaf, flower, and stem	Diabetic mice	[31][50]
Anxiolytic and sedative activity	Hydroalcoholic and aqueous extract	Rat, mice	[31][40][51]
Antihypertensive	Extract from leaves and stems	-	[31]
Anthelmintic and larvicidal activity	Aqueous stem bark and leaf extract	Helminths in Nigerian dogs	[31][52][53][54]
Immunomodulatory	Whole plant	Fish	[31]

activity			
Cytotoxic activity	Ethanol extract of the whole plant	Brine shrimp larva	[55]
Aflatoxin inhibition activity	Aqueous extract	Rice, wheat, Maize and groundnut	[56]
Cardiovascular activity	Petroleum ether phase of the methanolic extract	-	[57]
Vasodepressor activity	Ethanol extract	Adult Male, Wistar Albino rats	[57]
Toxic effects	Aqueous stem, bark, and leaf extracts	Rat, brine shrimp	[31][58][59]

treat a variety of diseased conditions including asthma, coughs, diarrhea and dysentery. Various traditional uses of the *E. hirta* are mentioned in Table 2.

Pharmacology

Following the folk and traditional uses of the plant, it has been investigated scientifically to validate the potential of the plant in cure of variety of ailments. Some of the reported pharmacological activities of *E. hirta* are mentioned in Table 3.

DISCUSSION AND CONCLUSION

Phytochemical and pharmacological investigations carried out in the plant reveals its multidisciplinary usage. While some of the reported scientific uses include its use as an antispasmodic, antiasthmatic, expectorant, anticatarrhal and antisyphilitic.^{[1][11][41][60]} Most of the activities of the plant were believed to be due to the presence of choline, shikimic acid and the quercetin.^{[1][23][60]} The plant was found to be very useful as an antibacterial, antifungal^{[29][30][31]} and also anti-diabetic.^{[50][31]} Antitumour potential was the exciting aspects of the plant.^{[47][48][49][31]}

It is very essential to have a proper documentation of medicinal plants and to know their potential for the improvement of health and hygiene through an eco-friendly system. A detailed and systematic study is required for identification, cataloguing and

documentation of plants, which may provide a meaningful way for the promotion of the traditional knowledge of the herbal medicinal plants. The present review reveals that the *E. hirta* is used in treating various ailments.

Although *E. hirta* has been used wildly to treat various diseases in many countries, most of the involved molecular mechanisms have not been fully explored. However, the anti-infection of *E. hirta* is due to its direct bactericidal activity. Anti-inflammatory and antioxidative activities of *E. hirta* can also be expected to use in treating scald, preventing sepsis or other chronic inflammatory diseases. Aflatoxin inhibition activity can be used in detoxifying the toxin from grains. Anti-tumor activity of methanol extract of *E. hirta* can be used in the treatment of cancer.

Further investigation should carried out by modern instruments like HPLC, HPTLC and NMR in order to isolate and elucidate the active ingredients present in different parts as an aid to the preliminary phytochemical analysis. The pharmacological experiments conducted in this plant need to run in future to develop a novel drug that has limited side effects.

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