

TLC profiling and Pharmacognostic, Physicochemical, Phytochemical Evaluation of *Euphorbia hirta*

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Abstract

Euphorbia hirta Linn, commonly referred to hairy herb and used in various traditional systems, is a member of the Euphorbiaceae family. The objective of this study is to gain comprehensive pharmacognostic, physicochemical characteristics, and phytochemical analysis of the leaves. The pharmacognostic criteria were assessed, including macroscopic and microscopic evaluations, transverse sections of the leaf and stem; powder fluorescence analysis, and physicochemical properties (Total Ash 5.50%, acid-insoluble ash 3.80%, water-soluble ash 1.6%; alcohol-soluble extractive value 13.20%, water-soluble extractive value 8.40%; moisture content 6.40%. Phytochemical screening of ethanolic leaf extracts indicates the presence of alkaloids, terpenoids, flavonoids, saponins, and tannins. The Rf values determined were 0.88, 0.90, and 0.94. The standardized parameters for pharmacognostics, physicochemical parameters, phytochemical properties, and chromatographic analyses of *Euphorbia hirta* leaves are revealed in this work.

Keywords: Fluorescence analysis; Physicochemical; Thin layer chromatography; Phytochemical screening; Microscopy

1. Introduction

Euphorbia hirta Linn. is frequently referred to as milkweed (Dudhy) and is recognized as an asthma remedy. It is referred to by various names in different regions of the world [1]. The plant is distinguished by the presence of milky white latex, which exhibits varying degrees of toxicity. This family of plants has undergone extensive phytochemical analysis, including flavonoids, triterpenoids, alkanes, amino acids, and alkaloids [3]. *E. hirta* is used as a traditional remedy for conjunctivitis, bronchial and respiratory conditions (asthma, bronchitis, hay fever, laryngeal spasms, cough colds, etc.), and gastrointestinal disorders (diarrhea, amoebic dysentery, intestinal parasitosis, peptic ulcers, etc.) [4,5,6]. Furthermore, contemporary pharmacological studies have demonstrated that *E. hirta* and its active components exhibit a broad spectrum of pharmacological potential namely, antidiabetic, antitumor, antimalarial, antiasthmatic antibacterial, anti-inflammatory, antifungal, diuretic, antioxidant, and larvicidal properties [7-9]. Notably, *E. hirta* is also employed as an anti-inflammatory, anti-spasmodic, antidiabetic, and anticancer therapeutic agent [10]. In China, *E. hirta* has long been utilized as a medicinal herb. Additionally, many compositions are utilized, including powders, lotions, infusions, decoctions, and crude drugs [11]. The plant *E. hirta* has several biological and pharmacological qualities that make it an important part of the traditional medical system. In light of *E. hirta* ability to treat body swelling and skin ulcers, the plant was initially identified in "Ling Nan Cai Yao Lu." In China, there are also around ten books about the traditional medicinal applications of this plant [12].

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2. Materials and Methods

2.1. Plant collection

Fresh Plants of *Euphorbia hirta* L were collected from local area of Prayagraj, U.P., and India. The plant material identified and authenticated by Botanical Survey of India (BSI), Prayagraj, Authentication No.2025-26/ 54 on dated 11/04/2025.

2.2. Macroscopic studies

Organoleptic characteristics, such as color, taste, texture, shape, and size, were used in morphological investigations and assessed botanically [13, 14].

2.3. Microscopic studies: [15, 16, 17]

Leaf and stem was cut into tiny transverse slices for microscopic examination. For additional observations and the identification of particular microscopic diagnostic features, the slices were placed in a glycerine water solution. Additionally, the powder properties and fluorescence examination were performed.

2.4. Physicochemical parameters [18, 19]

After powdering the dried plants of *E. hirta*, several physicochemical analyses were performed and values were noted, including those for foreign matter, moisture content, extractive value, and ash value.

2.5. Phytochemical screening [20, 21, 22]

100g of *E. hirta* powder in a Soxhlet extractor, fruit medicine powder was extracted using 95% ethanol. Following the concentration of the liquid extract, a number of qualitative chemical assays were performed and documented.

2.6. Thin layer chromatography [13, 22]

- Using an activated silica gel G plate as the stationary phase, Pet. ether: Ethyl acetate: Acetic acid (40:40:20)
- As the mobile phase, and sulphuric acid as the detecting reagent, an alcoholic extract of *E. hirta* was assessed for TLC.

3. Results and Discussion

3.1. Macroscopic study

The leaf and stem macroscopic and organoleptic characteristics, including color, taste, shape, size, and surface were assessed botanically (See table 1).



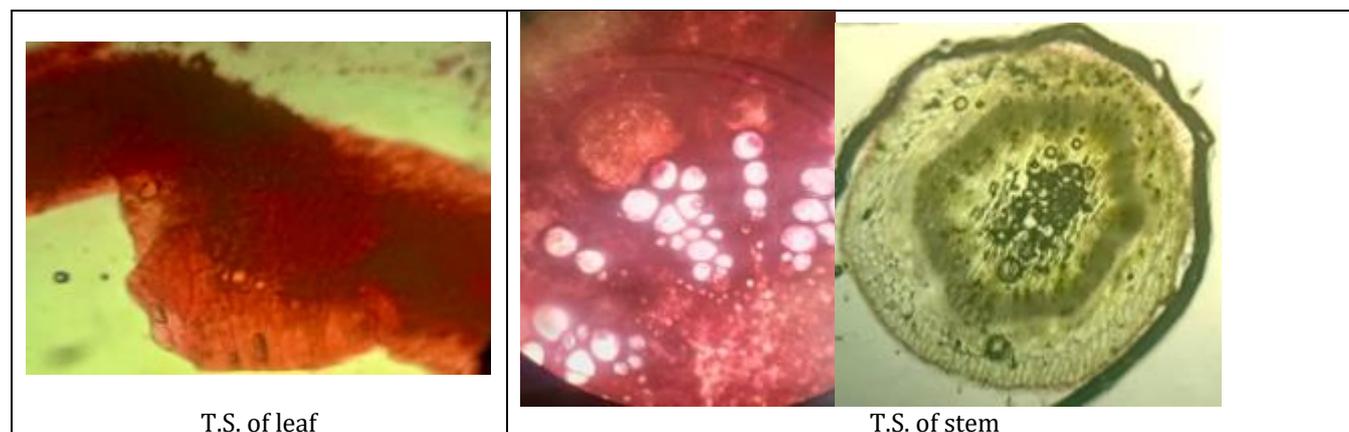
Figure 1 *Euphorbia hirta* plant

Table 1 Macroscopic study of *Euphorbia hirta* Linn. Leaf and Stem

Characters	Leaf	Stem
Colour	Dark green upper surface and pale green lower surface	Reddish purplish
Odour	Characteristic	Characteristics
Taste	Bitter	Bitter
Size	1-4 cm long, 1- 2 cm width	7-80 cm in length
Botanical evaluation of Leaf		
Margin	Toothed margin	
Apex	Acute	
Venation	Reticulate	
Surface	Hairy	
Base	Unequal	
Shape	Simple, opposite, oblong, lanceolate	

3.2. Microscopic study:

Transverse section of *E. hirta* leaves have a uniseriate epidermis with thin cuticle and the mesocarp has two to six layers of large, parenchymatous, elongated cells with starch grains, while the stem has a circular, wavy single layer epidermis, a multilayer cortex, and collateral vascular bundles (See Fig. 2)

**Figure 2** Transverse Section of *Euphorbia hirta* leaf and stem**Table 2** Fluorescence analysis of *Euphorbia hirta* Linn leaf powder

Treatment	Visible	Short U.V. 254 nm	Long U.V. 365 nm
Powder	Dark green	Slight green	Blackish green
Powder + water	Clear	Greenish	Light green
Powder + NaOH	Light yellow	Greenish	Greenish
Powder + FeCl ₃	Brownish yellow	White	Green
Powder + dil. H ₂ SO ₄	Blackish brown	Brownish-green	Light green
Powder + dil. HCl	Light green	Green	Dark green
Powder + dil. HNO ₃	Green	Brownish-green	Light green

Powder + Ethanol	Yellowish green	Yellowish	Pale yellow
Powder + KOH	Brownish yellow	Light yellow	Dark green

Table 3 Physicochemical data of *Euphorbia hirta* Linn leaf

S.N.	Physicochemical Parameter	Values (% w/w)
1.	Foreign matter	Nil
2.	Moisture Content	6.40%
3.	Total Ash	5.50%
4.	Acid- Insoluble ash	3.80%
5.	Water soluble ash	1.60%
6.	Alcohol soluble extractive	13.20%
7.	Water soluble extractive	8.40%

3.3. Qualitative phytochemical screening

Several secondary metabolites are detected by phytochemical screening of the ethanolic extract of *Euphorbia hirta* leaves. Alkaloids are detected by Hager's and Wagner's reagent tests, but triterpenoids and flavonoids are more abundant. There were also steroids, tannins, and saponins (See table no. 4).

Table 4 Qualitative Phytochemical screening of ethanolic extract of *E. hirta*

	Phytochemical test	Ethanolic extract of <i>E. hirta</i> Linn.
1.	Carbohydrates i) Molisch ii) Fehling Reagent	-ve -ve
2.	Alkaloids i) Dragondroff's reagent ii) Mayer's reagent iii) Wagner reagent iv) Hager reagent	+ve +ve +ve +ve
3.	Tannins i) Lead acetate ii) FeCl ₃	+ +ve
4.	Flavonoids i) Shinoda test ii) Zinc- HCl reduction test iii) Alkaline reagent test	+ve +ve +ve
5.	Saponins i) Foam test ii) Haemolytic activity	+ve +ve
6.	Steroids i) Libermann - Burchard test	+ve
7.	Cardiac glycosides	

	Keller-Kiliani	-ve
8.	Triterpens Salkowski's test	+ve

+ve Present, -ve absent

Figure 3 Chemical tests of ethanoilc extract of *E. hirta*Table 5 TLC Profile: Thin layer chromatography of alcoholic extract of *Euphorbia hirta* Linn

Solvent system	No. of spots	Rf value	
Pet. ether : Ethyl acetate: Acetic acid (40:40:20) Spraying agent : Sulphuric acid	3	0.88, 0.90, 0.94	

4. Conclusion

The common species of plant *Euphorbia hirta* Linn has been utilized for centuries. The aforementioned studies on pharmacognosy, physicochemistry, phytochemistry, and chromatography will provide methods for identifying, evaluating, and assessing safety and quality parameters. They will also provide new motivation for the use of natural medicine in research and treatment of various illnesses.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed. No animals were used in this research.

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