



Pharmacognostical and Phytochemical Screening of Roots of *Euphorbia hirta* Linn.

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Abstract

India is known worldwide for its Ayurveda medicines. There are many species of *Euphorbia* from family Euphorbiaceae which are used in traditional medicines. *Euphorbia hirta* exudes a milky juice when broken, which is more or less poisonous. *Euphorbia hirta* is traditionally used for asthma, gastrointestinal disorders, bronchial and respiratory diseases, kidney stone, diabetes, dysentery, jaundice, and tumors. In this study an attempt was made to undergo detailed pharmacognostical and preliminary phytochemical investigation of the roots of *euphorbia hirta* linn. These parameters help in standardization of crude drug. Preliminary Phytochemical screening of root extract of *euphorbia hirta* revealed the presence of alkaloids, flavonoids, saponins, terpenoids and steroids.

Keywords

Euphorbia hirta, Pharmacognostical analysis, Preliminary phytochemical screening, Root extracts.

INTRODUCTION

In India medicinal plants have been used to cure many diseases from ancient times. The Ayurvedic, Siddha, and Unani system of medicine, has been in existence for several centuries. Some drugs from Ayurveda have already reached the market place [1]. Phytochemistry is the branch of chemistry, which deals with study of chemical nature of the plant. Phytochemicals are the natural chemical constituents, found in plants that shows specific therapeutic effect. In modern medicines, plants play a very important role as the raw material for the important drugs. Synthetic drugs are effective in controlling different diseases but these synthetic

drugs are out of reach of millions of people and have many side effects [2].

The plant contains a variety of chemical constituents and they are broadly classified into two types, primary and secondary metabolites. Primary metabolite includes carbohydrates, lipids, proteins, amino acids and chlorophyll etc and secondary metabolites includes alkaloids, essential oils, flavonoids, tannins, terpenoids and saponins [3]. The secondary metabolites are naturally synthesized in all parts of the plant specially root, flower, fruits, seeds, bark, leaves, stem etc [4]. Hence, Extraction plays an important role in the analysis of phytochemical constituents present in plants.

Euphorbia hirta (*Euphorbiaceae*), commonly known as "Dudhi" is a small annual hairy plant. The stem of *euphorbia hirta* is slender, reddish in color, covered with yellowish hairs. The leaves are oppositely arranged, lanceolate and are usually greenish or reddish in colour. It is found abundant in waste places along the roadsides and open grasslands. It is native to India and Australia [5,6]. The small green flowers constitute the inflorescence characteristic of the euphorbias. It has been reported to contain alkaloids, flavonoids, saponins and tannins. Traditionally, it is used in the treatment of gastrointestinal disorders, bronchial and respiratory diseases, kidney stone and diabetes. It also shows antipyretic, analgesic and anti-inflammatory activities [7,8]. *E.hirta* contains Afzelin, quercitrin and myricitrin. The chemical analysis of *E. hirta* shows presence of quercetin, euphorbin-A, euphorbin-B, euphorbin-C, euphorbin-D, 1,3,4,6-tetra-*O*-galloyl- β -D-glucose, kaempferol, gallic acid, and protocathechuic acid. *E. hirta* also contains β -amyirin, 24-methylenecycloartenol, β -sitosterol, heptacosane, nonacosane, shikmic acid, choline, camphol, and quercitol derivatives [9,10,11].

MATERIAL AND METHODS:

The roots of *Euphorbia hirta* were collected in the month of December 2018 from Hodal, India. A voucher specimen has been retained at the School of Medical and Allied Sciences, K.R. Mangalam University, Sohna Road, Gurgaon. The roots were cleaned thoroughly with distilled water to remove any type of contamination. Washed roots were air dried in shade.

Extraction by using Soxhlet apparatus:

To prepare various extracts of *Euphorbia hirta* Linn, the dried roots were powdered by using dry grinder and passed through sieve. This powder was packed into Soxhlet apparatus and extracted successively with different solvents, starting from solvent of low polarity to high polarity. The process was continued until the solvent in the thimble becomes transparent. All the extracts were dried at 45^o C in rotary evaporator to produce a semisolid mass and stored in airtight containers in refrigerator below 10^o C [12].

Determination of extractive value: Extractive values are used to evaluate the nature of phytochemicals present in the crude drugs. The extractive yield is a measure of the solvent's efficiency to extract specific constituents from the drug material and it was defined as the amount of extract recovered compared with the initial amount of whole plant (in mgs). It is expressed in percentage.

PHARMACOGNOSTICAL STUDIES:

Macroscopic characters:

Macroscopical features relating to shape, size, texture, colour, surface characteristics and fracture were examined for identity and purity of material.

Microscopical characters:

The transverse section of the young root was studied.

Powder drug study:

Powder drug study of *euphorbia hirta* was carried out.

Foreign matter:

The term Foreign matter is used to define any matter, which does not form part of a drug. 100 gm of powdered drug was taken and spread out in a thin layer and sorted the foreign matter into groups with help of a sieve. Plant material collected is now free from foreign material like soil, insect parts, fibres etc. They are separated and weighed and the percentage was calculated.

Powdered drug reaction with different reagent:

Powdered drug was treated with different reagents and was observed from naked eye.

Physio-Chemical Constant Screening:

Physical constants and fluorescence studies were performed according to the standard procedures reported [13, 14,15].

The fluorescence nature of the root powder of *Euphorbia hirta* was observed under day light and UV light after treatment with various chemical reagents [16].

Preliminary Phytochemical Screening:

The successive extracts of the *Euphorbia hirta* Linn obtained were subjected to various standard phytochemical tests procedures to detect the presence or absence of various active phytoconstituents present in the crude extracts [17,18,19,20].

RESULTS:

Macroscopic characters: Macroscopic characteristics of *euphorbia hirta* roots were given in Table 1.

Microscopical characters: The transverse section of the young root is irregular circular in shape (Fig. 1) and it shows a wide xylem, cortex and a narrow phloem. Cork has 6-7 layers. Phloem is very narrow and comprises of phloem parenchyma and phloem fibers. Cortex is parenchymatous. Medullary rays are also parenchymatous. Maximum portion of root is covered by xylem and xylem is composed of xylem fibers, xylem parenchyma and xylem vessels.

Powder studies:

The root powder examination showed the presence of cork cells, vessels with medullary rays, xylem and starch grains (Fig. 2)

Powdered drug reaction with different reagent:

Powdered drug was treated with different reagents and the colour changes were observed. The results are tabulated in Table 2.

Physio-Chemical analysis:

In the present study, *Euphorbia hirta* roots extracts were subjected to physio-chemical and phytochemical screening to detect phytochemical constituents. Ash value includes total ash, acid insoluble ash, and water soluble ash values. Ash values of *Euphorbia hirta* roots were determined and the results were given in Table 3. The total ash, acid insoluble ash and water soluble ash values of powdered *Euphorbia hirta* roots were found to be 8.78, 7.64 and 1.02 % w/w respectively.

Physical constants:

The results of moisture content and foreign organic matter were presented in Table 4. The moisture content was found to be 8.24%. Percentage yield of the selected extracts of *Euphorbia hirta* roots powder were recorded in Table 5. The percentage

yield of each extract was utilized to give extractive values and the extractive values were found to be 8.15% w/w with aqueous extract and 9.65% w/w with ethanol, while 3.45 % w/w yield with pet. ether.

Fluorescence analysis:

The fluorescence analysis of the powdered roots towards ordinary light and ultraviolet light (long wavelength 365nm and short wavelength 254nm) on treatment with various reagents was shown in Table 6.

PRELIMINARY PHYTOCHEMICAL SCREENING OF ROOTS OF EUPHORBIA HIRTA:

The results indicated the presence of specific phytoconstituents in the plant powder by fluorescence and its presence was later confirmed by the phytochemical tests. Details of various tests performed for the presence or absence of phytoconstituents in the four different extracts as per the standard procedures were summarized in Table 7. The four extracts aqueous, ethanol, chloroform and pet. Ether of *Euphorbia hirta* roots were evaluated for the detection of phytochemical constituents such as carbohydrate, alkaloid, flavonoid, terpenoid, tannin, saponin and reducing sugars etc.

Table 1: ORGANOLEPTIC CHARACTERISTICS OF EUPHORBIA HIRTA ROOTS:

Character	Inference
Taste	Tasteless
Odour	Odourless
Colour	Dark brown
Texture	Rough
Fracture	Fibrous
Diameter	5-8mm

Table 2: POWDERED DRUG REACTION WITH DIFFERENT REAGENTS:

Treatment	Observation
Powder as such	Greenish brown
Powder + 1N HCL	Dark green
Powder + Conc. HNO ₃	Light brown
Powder + 1N NaOH	Yellowish green
Powder + Glacial acetic acid	Light yellow

Table No. 3: PHYSIOCHEMICAL ANALYSIS OF POWDERED ROOTS OF EUPHORBIA HIRTA.

Physio-Chemical Analysis	Yield (% w/w)
Ash values	
Total Ash	8.78
Acid insoluble Ash	7.64
Water soluble Ash	1.02

Table 4: PHYSICAL CONSTANT VALUES OF EUPHORBIA HIRTA EXTRACTS:

S.No.	PHYSICAL CONSTANT	values(% w/w)
1.	Moisture content	8.24
2.	Foreign organic matter	0.51

Table 5: SOLVENT EXTRACTIVE VALUES AND NATURE OF EXTRACTS OF EUPHORBIA HIRTA:

S.No.	Solvent	Colour	Consistency	Extractive value(%w/w)
1.	Aqueous	Dark black	Semi-solid	8.15
2.	Chloroform	Creamy brown	Semi-solid	0.65
3.	Ethanol	Brownish black	Semi-solid	9.65
4.	Pet. Ether	Light brown	Semi-solid	3.45

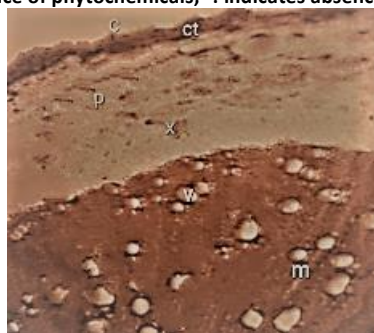
Table 6: FLUORESCENCE ANALYSIS OF THE POWDERED ROOTS OF EUPHORBIA HIRTA

Experiments	Powdered Drug		
	Fluorescence under Visible/day light	Fluorescence under short UV (254nm)	Fluorescence under Long UV(365nm)
powder as such	Dark green	Light green	blackish green
0.5 g of powder + 5ml of 1M NaOH	Light yellow	Green	Moderate green
0.5 g of powder + 5 ml of 50% HCL	Light green	Green	Dark green
0.5 g of powder + 5ml of 50% HNO ₃	Green	Brownish green	Light green
0.5 g of powder + 5ml of 50% H ₂ SO ₄	Slightly green	Brownish green	Light green
0.5 g of powder + 5 ml of 5% FeCl ₃	Yellowish brown	White	Green
0.5 g of powder + 5 ml of KOH	Brownish black	Light green	Dark green

Table 7: PRELIMINARY PHYTOCHEMICAL ANALYSIS OF ALCOHOLIC EXTRACT OF EUPHORBIA HIRTA

S.NO.	Phytochemical constituents	Aqueous extract	Chloroform extract	Ethanol extract	Pet. Ether extract
1.	Alkaloids	—	—	+	—
2.	Flavanoids	+	+	+	+
3.	Terpenoids	+	+	+	+
4.	Tannins	—	—	+	+
5.	Saponins	+	—	+	+
6.	Carbohydrate	+	—	+	—
7.	Reducing sugars	+	—	+	+

+: indicates presence of phytochemicals, -: indicates absence of phytochemicals


FIG. 1: TRANSVERSE SECTION OF ROOT OF EUPHORBIA HIRTA: c- cork, ct cortex, p-phloem, x-xylem, m-medullary rays, v-vessels

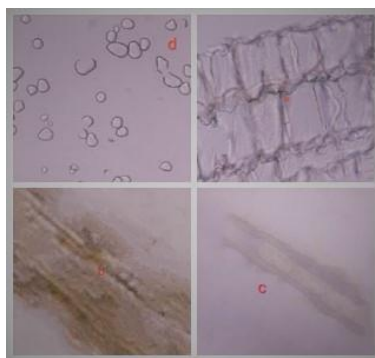


FIG. 2: Powder characteristics of root: a- cork cells, b- medullary rays and vessels, c- xylem fibre, d- starch grains

DISCUSSION

In the present study, the Total Ash value of *Euphorbia hirta* indicates the amount of the earthy materials present in the plant material i.e. roots and its value was found to be 8.78 % (w/w). This study shows that the plant has more acid insoluble ash value of 7.64% w/w than water insoluble ash 1.02% w/w respectively. The water soluble ash value is used to detect the presence of material soluble in water and it indicates the presence of sugars and inorganic compounds. The ethanol soluble extract was found to be 9.65% (w/w). This alcoholic extractive value indicates the presence of constituents like glycosides, flavonoids, alkaloids and secondary metabolites and Extractive values are also used to evaluate the nature of the chemical constituents present in the plants. The results of the present study shows that relatively more constituents are present in ethanol extract than other extracts. The moisture content of *Euphorbia hirta* roots was found to be 8.24% as recommended not more than 14%. The powdered roots of *Euphorbia hirta* exhibited a clear fluorescence behavior when observed under day light and UV light. Preliminary phytochemical screening is used to identify the constituents present in the plant extract, which further leads to the isolation of active compounds, responsible for many pharmacological activities. The solvents used were aqueous, ethanol, chloroform and pet. ether. From the results, it was confirmed that the plant *Euphorbia hirta* contains a number of chemical constituents which may be responsible for many pharmacological activities. Alkaloids have been reported to have antimicrobial, analgesics, flavonoids have been showed pharmacological effects like antioxidant, anti-inflammatory, anti-cancer, anti-diabetic, diuretic effect while tannins have been found to possess free radical scavenging property and antioxidant activity as pharmacological activities.

CONCLUSION:

The present study shows the presence of many phytochemical constituents in the root extracts of *Euphorbia hirta* Linn. *Euphorbia hirta* (Family-Euphorbiaceae) commonly known as dugdhi is an important drug of Ayurvedic medicines. The present study helps us to validate the traditional uses of *Euphorbia hirta*. Now our efforts are concerned with isolation of active constituents from *Euphorbia hirta* Linn.

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