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PHARMACOGNOSTICAL INVESTIGATION OF *RICINUS COMMUNIS* STEM

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ABSTRACT

Castor (*Ricinus communis* L, Euphorbiaceous) is needed in the United States to supply caster oil for the hundred of products using this versatile chemurgical raw material. 40-45 thousand tons of castor oil and derivatives are imported each year. *Ricinus communis* is a common medicinal plant in Ayurveda and is used several part of country for various medicinal properties like the oil of leaf and root are used against various ailments. The oil is useful for skin diseases. Castor oil seeds have tonic effect. The oil is emollient, laxative and it can be used in cases of inflammation of the intestine or dysentery. The present work attempts to summarize the Pharmacognostical characters of the *Ricinus communis* stem. Ash and extractive values, chemical test, HPTLC, Histological color reactions and fluorescence analysis were also carried out.

INTRODUCTION: Natural products continue to form a significant proportion of drugs in current use and those of under investigation. It has been estimated that 56% of the lead compounds for medicines in the British National Formulary are natural products or derived form natural products [1]. Phytochemical investigations carried out during the 1970s and 1980s have discovered a number of alkaloids and other pharmacologically active substances that are currently being studied and that can possible serve as models for new synthetic compounds [2]. There are about 1250 Indian medicinal plants, which are used formulating therapeutic preparation according to Ayurveda and other traditional system of medicine [3].

Ricinus communis belongs to family Euphorbiaceae. The plant is native of India and cultivated throughout the country in gardens and fields and also grows wild in waste places [4]. Production of caster (*Ricinus communis* L, Euphorbiaceous) is needed in the United States to supply caster oil for the hundred of products using this versatile chemurgical raw material. 40-45 thousand tons of castor oil and derivatives are imported each year [5]. To supply the entire needs of our domestic industries, castor was in production as early as the mid-1850s in the central part of the United States and over 23 crushing mills reportedly were operational at that time [6]. The castor plant is not toxic to most insects, even small amounts of the toxic protein ricin, and the alkaloids tricinine occurs in vegetative parts of the Plants. *Ricinus communis* is a small wooden tree which grows to about 6 meters in height and found in South Africa, India, Brazil, and Russia. [7- 9]. Stems of *Ricinus communis* have Anticancer, Antidiabetic and Antiprotozoal activity [4]. The present investigation was undertaken to standardize the stems of Ricinus communis by carrying out Pharmacognostical characteristics.

MATERIALS AND METHODS:

Plant Material: The stems of Ricinus communis were collected from the Koraon, District Allahabad Uttar Pradesh in the Month of April and Authenticated by Dr. Gaurav Nigam, Department of Botany, Institute of Basic Sciences, Bundelkhand University, Jhansi (Uttar Pradesh) India.

Preparation of extracts: The fresh stems were dried under shade, powdered and pass through 40 mesh sieve and stored in closed containers for further use. The powder was extracted with different solvents ranging from non-polar to polar solvents. About 200 g of the crude drug powder was subjected for extraction (Soxhlet extraction) in round bottom flask, first with petroleum ether (40-60°C) for 18-20 hours. The extract was concentrated under reduced pressure at 50-60°C. The dried marc of *Ricinus communis were* once again subjected to successive extraction with different solvents viz, benzene, Chloroform, methanol and water and the % of extracts were 0.6, 1.3, 34.5 and 12.5 respectively.

Ash Values: Ash values are helpful in determining the quality and purity of crude drugs, especially in powder form[10]. Some analysis favor mixing of sulfuric acid with the powdered crude drug before ashing and this sulfated ash is normally less fusible than ordinary ash [11].

Total Ash: About 3 g of powdered bark was accurately weighed and taken in a silica crucible, which was previously ignited and weighed. The powder was spread as a fine,

even layer on the bottom of the crucible. The crucible was incinerated gradually by increasing temperature to make it dull red hot until free from carbon. The crucible was cooled and weighed. The procedure was repeated to get constant weight[12]. The results are shown in Table 1.

Acid Insoluble Ash: The ash obtained as described above was boiled with 25 ml of 2N HCl for five minutes. The insoluble ash was collected on an ash less filter paper and washed with hot water. The insoluble ash was transferred into a silica crucible, ignited and weighed. The procedure was repeated to get a constant weight [13]. The results are shown in Table 1.

Water Soluble Ash: The ash obtained as described in the determination of total ash was boiled for 5 minutes with 25 ml of water. The insoluble matter was collected on ash less filter paper and washed with hot water. The insoluble ash was transferred into silica crucible, ignited for 15 minutes, and weighed. The procedure was repeated to get a constant weight. The weight of insoluble matter was subtracted from the weight of the total ash. The difference of weight was considered as water-soluble ash[12, 13]. The results are shown in Table 1.

TABLE 1: THE RESULT OF TOTAL ASH, ACID INSOLUBLE ASH AND WATER SOLUBLE ASH OF *RICINUS COMMUNIS*

TYPE OF ASH	PERCENTAGE* (W/W)
Total Ash	8.86
Acid Insoluble Ash	2.61
Water Soluble Ash	4.36

*Average of three determinations

Extractive Values: Extractive values of crude drugs are useful for their evaluation, especially when the constituents of a drug can not be readily estimated by any other means. Further, these values indicate the nature of the constituents present in a crude drug [11].

As per I.P. 1985 the ethanol soluble, petroleum ether soluble, benzene soluble, diethyl ether soluble, toluene soluble and methanol soluble extractive values were as shown in table 2.

TABLE NO. 2: EXTRACTIVE VALUES OF *RICINUS COMMUNIS* STEM

TYPE OF EXTRACTIVE VALUE	PERCENTAGE* (W/W)
Ethanol Soluble Extractive	3.48
Methanol Soluble Extractive	2.40
Benzene Soluble Extractive	2.40
Petroleum ether Soluble Extractive	4.89
Toluene Soluble Extractive	2.32
Benzene soluble Extractive	0.98

*Average of three determinations

Phytochemical screening of Ricinus communis stems extract: The successive extracts of petroleum ether, benzene, chloroform, methanol and water extracts were subjected to various chemical tests for the identification of the phytoconstituents. The results are shown in table 3.

Fluorescence Analysis: Fluorescence characters of the stems powdered and extract were observed under UV (254 & 366 nm.) and visible light [14, 15]. The results are shown in table 4.

TABLE NO. 3-: PHYTOCHEMICAL TESTS OF THE SUCCESSIVE EXTRACTS OF *RICINUS COMMUNIS* STEMS

CHEMICAL CONSTITUENTS	AQUEOUS EXTRACT	PET. ETHER EXTRACT	METHANOL EXTRACT	BENZENE EXTRACT	CHLOROFORM EXTRACT
Alkaloids	-	+	-	+	+
Carbohydrates	+	-	+	-	-
Steroids and Sterols	-	+	-	+	+
Glycosides	-	-	-	-	-
Saponins	+	-	+	-	-
Flavonoids	-	-	+	-	-
Tannins	-	+	-	+	+
Phenolic Compounds	-	+	-	+	+
Triterpenoids	-	-	-	-	-
Proteins and Amino acids	+	-	+	-	-
Fixed Oils and Fats	-	-	+	-	-

+ = Present, – = Absent

TABLE-4: FLUORESCENCE ANALYSIS OF THE SUCCESSIVE EXTRACTS OF *RICINUS COMMUNIS* STEMS

DRUG & REAGENTS	UV LIGHT		VISIBLE LIGHT
	SHORT (254 NM)	LONG (366 NM)	
Powder as such	Yellow	Brown	Light yellow
Powder + Glacial acetic acid	Yellowish white	Brown	Light yellow
Powder + 1N H_2SO_4	Yellowish white	Brown	Reddish yellow
Powder + 1N Dil. HCl	Yellowish white	Bluish brown	Light
Powder + Conc. HCl	Light green	Greenish brown	Light yellow
Powder + Conc. HNO_3	Green	Dark brown	Reddish brown
Powder + Conc. H_2SO_4	Greenish black	Black	Blackish brown
Powder + 1N NaOH	Light green	Brown	Reddish yellow
Powder + Trichloro- acetic acid solution	Green	Light brown	Greenish yellow
Powder + Methanol	Light green	Greenish brown	Light yellow
Powder + Diethyl ether	Green brown	Yellowish white	Light yellow
Powder + ethanol	Light green	Brown	Yellowish white
Powder + Chloroform	Light green	Brown	Yellowish white
Powder + Hexane	Greenish white	Light brown	Yellowish white
Powder + Ammonia	Greenish white	Greenish brown	Light yellow
Powder + toluene	Light green	Brown	Light yellow
Powder + Benzene	Green	Light brown	Yellowish white
Powder + n-Butanol	Light green	Brown	Yellowish white

HPTLC analysis of *Ricinus communis* stem extracts:

Application of Sample: Commercially available pre-coated plates of silica gel GF_{254} of 10 x 10 cm size were used for the study. The different extracts were applied on different plates with bandwidth of 5 mm. Application rate was maintained at 10 µl/min, using Linomate–IV applicator, (automatic TLC applicator, Camag, Switzerland). A sample volume of 50 µl was applied [16].

Chromatogram Development: The plates were developed in twin-trough chamber (No. 022.5155) using the solvent systems as used in TLC for the different extracts and isolated compounds. After developing, the plates were air-dried and observed under UV chamber (Camag UV chamber-3, model no. 022.9120).

Densitometric Scanning: The developed plates were scanned using densitometer at 256 and 366 nm (Camag TLC Scanner–3, model No. 027.6480). HPTLC studies were performed on all the extracts on the pre- coated plates and the suitable solvent system. Rf value and the percentage of the constituents in each extract were determined. The results are shown in table 5.

RESULTS AND DISCUSSION: The Phytochemical tests indicated the presence of Carbohydrate, proteins and amino acids, flavonoids and fixed oil in the methanolic extract; alkaloids, steroids, tannins and phenolic compounds in the benzene extracts and alkaloids, steroids, tannins and phenolic compounds in the petroleum ether extracts and chloroform extracts and carbohydrate, saponins and proteins and amino acid in the aqueous extract of *Ricinus communis* stem (Table 3). The suitable solvent systems, number of compounds, their Rf values and percentage peak area were determined by HPTLC for all successive extracts (Table 5). The fluorescence characteristics of the powdered stems when treated with various chemical reagents are shown in table 4. In conclusion, the present study on Pharmacognostical characters of *Ricinus communis* stem may be useful to supplement information in regard to its identification.

TABLE NO. – 5: HPTLC PROFILE OF SUCCESSIVE EXTRACTS OF *RICINUS COMMUNIS* STEM

EXTRACT	SOLVENT SYSTEM USED	NUMBER OF PEAKS	RF VALUE	PERCENTAGE PEAK AREA
Petroleum ether extract	Toluene : Ethyl acetate : Diethyl amine (7 : 2 : 1)	9	0.01, 0.06, 0.22, 0.35, 0.37, 0.40, 0.51, 0.61, 0.72	19.69, 10.53, 2.80, 0.58, 0.86, 0.34, 2.81, 2.46, 1.53
Benzene Extract	Toluene : Ethyl acetate : Diethyl amine (7 : 2 : 1)	8	0.02, 0.07, 0.17, 0.29, 0.37, 0.51, 0.66, 1.00	44.54, 16.73,10.29, 5.89, 3.37, 2.26, 2.46, 14.47
Chloroform Extract	Toluene : Ethyl acetate : Diethyl amine (7 : 2 : 1)	11	0.01, 0.08, 0.15, 0.21, 0.30, 0.36, 0.41, 0.46, 0.55, 0.66, 0.99	39.17, 24.44, 7.94, 3.32, 3.92, 0.63, 1.50, 0.99, 5.30, 0.68, 12.12
Methanol Extract	Toluene : Ethyl acetate : Diethyl amine (7 : 2 : 1)	4	0.01, 0.15, 0.18, 1.00	89.52, 1.56, 0.79, 8.12
Water Extract	Toluene : Ethyl acetate : Diethyl amine (7 : 2 : 1)	3	0.01, 0.03, 0.99	43.00, 53.59, 3.41

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