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**Neha Singh**  
Research Scholar, Department of  
Botany, S.G.S. Govt. P.G.  
College, Sidhi, Madhya Pradesh,  
India

**IP Kumhar**  
Professor, Department of  
Botany, S.G.S. Govt. P.G.  
College, Sidhi, Madhya Pradesh,  
India

**M Salim**  
Professor and Head, Department  
of Botany, S.G.S. Govt. P.G.  
College, Sidhi, Madhya Pradesh,  
India

**Corresponding Author:**  
**Neha Singh**  
Research Scholar, Department of  
Botany, S.G.S. Govt. P.G.  
College, Sidhi, Madhya Pradesh,  
India

## Phytochemical analysis of *Tribulus terrestris*

**Neha Singh, IP Kumhar and M Salim**

### Abstract

The Present paper deals with the phytochemical studies on *Tribulus terrestris* Linn. Fluorescence analysis has been performed and physicochemical characters such as ash values and extractive values have been performed. Preliminary phytochemical analysis and thin layer chromatographic behavior have also been performed for the various extracts.

**Keywords:** *Tribulus terrestris*, pharmacognosy, physicochemical characters, fluorescence analysis, thin layer chromatographic behavior

### Introduction

*Tribulus terrestris* is found in tropical climates of the world. It is found mainly in India, America, and Australia. It is very common in Sidhi (M.P.). In Ayurveda *Tribulus terrestris* is known as Chhote or Kanti Gokhru (Nadkarini, 1992) <sup>[1]</sup>. *Tribulus terrestris*, commonly known as 'Gokhru' is a flowering plant and belonging to the family Zygophyllaceae. The plant is widely distributed throughout India (Ekade and Manik, 2014) <sup>[2]</sup> and easily grows in the subtropical regions around the world (Jameel *et al.* 2012) <sup>[3]</sup>. Previous studies show that *Tribulus terrestris* has antimicrobial, antihypertensive, diuretic, anti acetylcholinine, haemolytic activity and used around the world for the treatment of sexual impotency, abdominal dysfunction, cardiovascular diseases and edema (Gincy *et al.* 2014 and Yanala *et al.* 2016) <sup>[4, 5]</sup>. In folk medicine *tribulus terrestris* used as tonic, aphrodisiac, analgesic, astringent, stomachic, antihypertensive and in urinary tract infections (Usman *et al.* 2007 and Batoei *et al.* 2016) <sup>[6, 7]</sup>. *Tribulus terrestris* is also called 'Puncture Vine' (Vasait, 2017) <sup>[8]</sup> and mainly known for its effectiveness in libido disorders, impotence and infertility (Nabaa *et al.* 2015) <sup>[9]</sup>. Hence, a systematic phytochemical study of *Tribulus terrestris* has been performed first time.

### Materials and Methods

#### Plant material

The fresh fruit of *Tribulus terrestris* was collected from Sidhi District (M.P.), India in the month of November 2020. The specimens were identified by a taxonomist Dr. A.A. Khan, Retired Professor of Botany, Govt. Girls P.G. College, Rewa (M.P.), India.

#### Phytochemical analysis

The traditional drugs are mainly based on the plants or material of natural origin (Venkataraman, 2000) <sup>[10]</sup>. Hence in the present investigation, a systematic determination of pharmacognostical characters such as Fluorescence analysis, Loss of weight on drying, Moisture content, Total ash, Acid insoluble ash, Water soluble ash, Residue on ignition, Extractive values, Preliminary phytochemical analysis and Thin layer chromatographic studies have been performed. Fluorescence analysis of the fruits samples and their extracts in different solvents were carried out. The ash values and the extractive values of the fruits samples were determined according to the methods of Pharmacopoeia of India (Anonymous, 1996) <sup>[11]</sup>. The air dried fruit powders were successively extracted with Petroleum ether (60-80 °C), benzene, chloroform, ethanol, water and the extracts were used for phytochemical analysis. The samples were subjected to fluorescence analysis at the light of wave length 365 nm (UV region). The samples were treated with acids and alkali before the analysis (Venkataraman, 2006) <sup>[12]</sup>.

## Results and Discussion

The fruits of *Tribulus terrestris* undergo fluorescence analysis; it shows green and pale green fluorescence noticed under ultraviolet light (365 nm). The crude drugs on treated

with 1N NaOH and 1N HCl show dark green or green fluorescence and on treatment with 1:1H<sub>2</sub>SO<sub>4</sub> and 1:1 HNO<sub>3</sub> show dark green fluorescence when viewed under UV light (365 nm).

**Table 1:** Fluorescence analysis

Light	Powder as such	1N NaOH	1N HCl	1:1H <sub>2</sub> SO <sub>4</sub>	1:1 HNO <sub>3</sub>	Name of the extract				
						Pet. ether	Benzene	Chloroform	Ethanol	Water
Ordinary	Pale brown	Dark Yellow	Brown	Dark brown	Dark yellow	Dark yellow	Dark brown	Pale black	Pale green	Dark yellow
Long-UV (365 nm)	Green	Dark green	Dark green	Black	Black	Red	Red orange	Orange	Pale blue	Greenish yellow
Short-UV (254 nm)	Pale Green	Green	Green	Pale black	Dark green	Dark yellow	Pale green	Pale green	Pale green	Pale green

**Table 2:** Physicochemical characters

Particulars	<i>Tribulus terrestris</i>
Loss of weight on drying	31.02%
Moisture content	10.68%
Total ash	12.57%
Water soluble ash	11.00%
Acid-insoluble ash	4.00%
Residue on ignition	7.43%

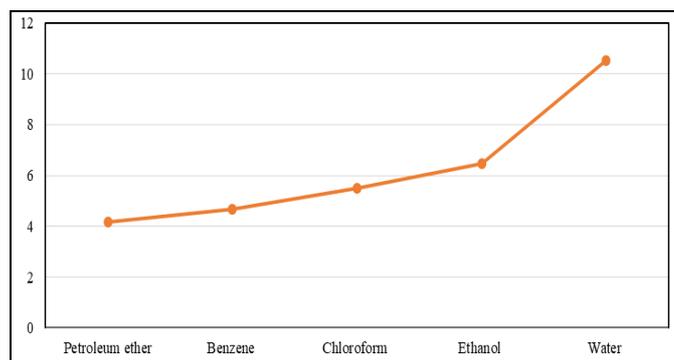
**Table 3:** Extractive values

Solvents	<i>Tribulus terrestris</i>
Petroleum ether (60-80 °C)	4.18%
Benzene	4.66%
Chloroform	5.50%
Ethanol	6.46%
Water	10.52%

**Table 4:** Thin layer chromatographic behavior of the fruit of *Tribulus terrestris* in Ethyl acetate: Benzene (1:9) Solvent System

Name of the Extract	R <sub>f</sub> value under UV light		R <sub>f</sub> value in iodine chamber
	Long – UV 365nm	Short – UV 254 nm	
Petroleum ether (60 – 80 °C)	*0.65	--	*0.65, ®0.52
Benzene	*0.55, ®0.48, ®0.89	--	*0.55, ®0.48, ®0.79, *0.84, ®0.89
Chloroform	--	--	*0.90, ®0.57
Ethanol	® 0.74	*0.62	*0.62, ®0.74, *0.84
Water	*0.83	*0.83	*0.83, ®0.52

\*=More intense ®=Less intense



**Fig 1:** Extractive percentage of *Tribulus terrestris*

The red orange fluorescence noticed for benzene and petroleum ether extracts under long –UV region. The aqueous and ethanol extracts of *Tribulus terrestris* show dark greenish white fluorescence under UV light. Loss of weight on drying ranges from 31 - 45% in the samples. The physicochemical

characters such as ash values of crude drugs are minimum (12.57%) in *Tribulus terrestris*. The acid-insoluble ash content of these drugs are less than 5%, water soluble ash values are less than 11% and residue on ignition values are less than 9%.

The extractive values increase as the polarity of the solvent increases. Among the extractive values, the water extract value is higher than others. In the preliminary phytochemical analysis of crude drugs, the sample extracts shows the presence of saponins, reducing sugars, triterpenoids, steroids, tannins and alkaloids. The pet. ether and chloroform extract of *Tribulus terrestris* contains flavonoids. Thin layer chromatographic behavior of the various extracts of the plants under the present investigation show very interesting results. The benzene extracts of both sample shows maximum spots in ethyl acetate: benzene (1:9) solvent system. All the pharmacognostical characters can be used as a diagnostic tool for the correct identification of the drug and also to test adulteration if any.

**Table 6:** Preliminary phytochemical screening of *Tribulus terrestris*

Extracts	Steroids	Triterpenoids	Reducing sugars	Alkaloids	Saponins	Tannins	Flavonoids
Pet. ether	+	+	+	+	+	+	+
Benzene	+	+	+	-	+	+	-
Chloroform	+	+	+	+	+	+	+
Ethanol	+	+	+	+	+	+	-
Water	-	-	+	-	+	+	-

+ = Positive - = Negative

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