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RESEARCH ARTICLE

Pharmacognosy and Phytochemistry of Leaves of *Tephrosia uniflora*

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ABSTRACT

The need for and significance of pharmacognostic analysis of leaf extracts of *Tephrosia uniflora* are discussed in the current research. The various extracts like petroleum ether, chloroform, alcohol, and aqueous leaf extracts of *T. uniflora* were prepared and studied for their organoleptic characteristics, macroscopic, powder microscopic, physicochemical analysis, phytochemical analysis, and fluorescence analysis of *T. uniflora*. The physicochemical evaluation shows that loss on drying was found to be 0.14% w/w, total ash value was 6.94% w/w, acid insoluble ash value was 3.16%w/w, and the extractive value of petroleum ether extract was 3.2% w/w. Chloroform extracts were found to be 3.9% w/alcohol extracts was found to be 4% w/aqueous extracts were found to be 4.8% w/Phytochemical analysis shows the presence of carbohydrates, phenols, flavonoids, alkaloids, and tannins. These are just a few of the parameters that need to be evaluated for a pharmacognostic study of *T. uniflora*.

Keywords: Fluorescence analysis, pharmacognostic study, physicochemical analysis, phytochemical study, *Tephrosia uniflora*

INTRODUCTION

Traditional medicine, which includes herbal medicines, has recently been defined by the WHO as including therapeutic practices that were utilized for hundreds or even thousands of years before modern medicine's rise and diffusion and are still in use today. Traditional medicine is a synthesis of the healing techniques used by generations of indigenous doctors. The only conventional medicines that can be considered "herbal drugs" are those that primarily use medicinal plant extracts. The use of herbal medicine is growing in popularity because of the toxicity and side effects of allopathic medicines. This led to a sudden rise in the number of companies that produce herbal medicines. Herbal treatments have been the principal treatment method in traditional medical systems since the dawn of civilization. The practices are still in use today because of their biological benefits, importance to the preservation of human health, and inclusion in many cultural beliefs.[1,2]

Tephrosia uniflora is a semi-erect perennial with silky stem hairs that can grow up to 1 m tall. *T. uniflora* is an herb that grows on rocky terrain and is sub-fruticose and abundantly branching. slender and angular branches from the base, pubescent growth. Most axillary or geminate flowers are single. A few pink, pea-shaped flowers appear in the leaf axils. Up to 4 mm long flower stalks are common. Calyx has up to 6 mm-long fangs and a tube that is covered with velvet-like hair. About 1 cm long and externally hairy in velvet. Compound leaves have leaf stalks that are 3–8 mm long and an axis that is about 2 cm long. Leaflets range in size from 5 to 9, are up to 5.5 cm long and 13 mm broad, have an inverted-lance or elliptic form, are pointy or blunt, and are hairless or velvet-hairy above and appressed hairy below. Stipules can be up to 9 mm long. Pods measure between 3.8 and 4.8 cm in length, 4–4.5 mm in width, and 7–8

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seeds in length. The Arabian Peninsula, Pakistan, and NW India, particularly Rajasthan, are the locations where rock *Tephrosia* is found. February through March and August through November are when flowers bloom.[3-7]

Tephrosia plants come in a wide diversity, and many of them have had their chemical makeup and pharmacological properties investigated. Flavonoids, rotenoids, and sterols are among *T. uniflora*'s key chemical classes. Flavonoids are the substances that have been isolated and identified the most frequently, which should be emphasized. *T. uniflora* has been studied for its components, which include elongatin (1), 12a-hydroxyrotenone (5), sitosterol, and stigmasterol.[8,9]

In herbal medicine, *T. uniflora* is commonly found and used to treat a wide range of ailments, such as stomachaches, diarrhea, asthma, inflammation, and respiratory issues. They've also been applied to the treatment of snake bites. Prenylated flavonoids and isoflavonoids produced by the genus have been shown to have cytotoxic, antiplasmodial, anticancer, antibacterial, and anti-inflammatory properties. Some flavonoids, particularly isoflavonoids, prevent bacteria from producing DNA, metabolizing their food, or forming cell membranes.[10]

By using step-by-step pharmacognostic research, standardization can be accomplished. These research projects aid in the identification and authentication of the plant's *T. uniflora*. To ensure the reproducible quality of herbal medicine, which will contribute to its safety and efficacy, correct identification and quality assurance of the raw materials are prerequisites that cannot be ignored. Its morphological, powder microscopy, phytochemical screening, and physico-chemical properties are pharmacognostic approaches utilized in the standardization of plant material.[11]

MATERIALS AND METHODS

Collection, Identification and Authentication of Plant Material

The plant's leaves, of *T. uniflora,* were collected. After drying in the shade, it turns into a coarse powder. The plant material that had been obtained was acknowledged and confirmed by scientist (Dr.) K Madhavachetty, M.Sc., M. Ed., M.Phil., PhD, PGDPD, assistant professor, Department of Botany, Tirupathi, India.

Morphological and Microscopical Features

T. uniflora was examined under a microscope and with the naked eye for macroscopical evaluation, noting the leaf's color, size, scent, and other diagnostic characteristics. There were differences in the leaves' macroscopic characteristics. Observing the type of leaf, form, arrangement, apex, margin, venation, base, texture, etc. was part of evaluating the leaves. Powder microscope, *T. uniflora's* full plant was coarsely ground up and examined under a microscope. A chloral hydrate reagent was used to macerate the powder. After being macerated, the powder was colored using phloroglucinol and HCl reagents. Glycerine was used to mount small amounts of the dyed powders on a slide. Photographs were obtained under a photomicroscope of the various cellular features and inclusions.[12]

Physicochemical Parameters

T. uniflora leaves have undergone physicochemical analysis in accordance with the WHO and pharmacopoeias' recommendations. Some of these requirements are total ash, acid-insoluble ash, water-soluble ash, extractive values that are water-soluble, and extractive values that are alcohol-soluble.[13-15]

Preparations of Extracts

Extract was made using the previously powdered medication. Different extracts are made by extracting plant material with increasing amounts of polarity from Pet ether, Chloroform, Ethanol, and Water. About 50 g of the air-dried powdered plant material were consecutively extracted in a Soxhlet apparatus with petroleum ether (40–60°), chloroform, and ethanol. Water extraction was carried out by maceration. The marc was air dried below 50°C each time before extraction using

the following solvent: With the aid of Whatmann filter paper, the extracts were purified, the solvent evaporated at room temperature, and precise weight measurements were taken. In order to calculate the extractive value (%), air-dried medication was used.

Preliminary Phytochemical Screening

To determine the presence or absence of major primary and secondary metabolites like carbohydrates, protein, alkaloids, steroids, phenol, glycosides, terpenoids, and flavonoids, among others, a preliminary qualitative phytochemical screening of plant extract from *T. uniflora* leaves was performed using standard methods.[16-18]

Fluorescent Analysis

T. uniflora leaf powders and extracts were treated with various solvents and reagents to produce distinct fluorescence characteristics, which were then observed in the visible light, short UV (254 nm), and long UV (366 nm) spectrums.[19]

RESULTS AND DISCUSSION

Morphology of *T. uniflora* Leaves

T. uniflora is an herb that grows on rocky terrain and is sub-fruticose and abundantly branching. slender and angular branches from the base, pubescent growth. Most axillary or geminate flowers are single. A few pink, pea-shaped flowers appear in the leaf axils. Calyx has up to 6 mm-long fangs and a tube that is covered with velvet-like hair. About 1 cm long and externally hairy in velvet. Compound leaves have leaf stalks that are 3–8 mm long and an axis that is about 2 cm long. Leaflets range in size from 5 to 9, are up to 5.5 cm long and 13 mm broad, have an inverted-lance or elliptic form, are pointy or blunt, and are hairless or velvet-hairy above and appressed hairy below. Stipules can be up to 9 mm long. Pods measure between 3.8 and 4.8 cm in length and 4–4.5 mm in width [Figure 1].

Microscopic Characteristic of Powder *T. uniflora* of Leaves

In this activity, powdered plant material is viewed under the microscope (Magnification ×45). All the lignified cells stained pink color. Calcium oxalate crystals were observed under the polarized light microscope. The powder characters are listed in Figure 2.

Whole plant leaves and flowers

Figure 1: Morphological characters of *Tephrosia uniflora* of leaves

Table 1: Physicochemical constants of leaves of *Tephrosia uniflora*

S. No.	Parameters	Percentage yield (% w/w)
1.	Losson drying	0.14
2.	Acidinsoluble ash	3.16
3.	Sulphated ash	2.6
4.	Watersoluble ash	5.3
5.	Total ash	6.94

Table 2: Yield of extracts obtained from successive extraction of leaves of *Tephrosia uniflora*

Plant name	Type of extract	Appearance/State	Yield (% w/w)
Tephrosia uniflora leaves	Pet ether	Yellowish green/Semisolid	3.2
	Chloroform	Greenish black/Semisolid	3.9
	Ethanol	Darkgreen, black/Semisolid	4
	Water	DarkBrown black/Semisolid	4.8

Table 3: Preliminary phytochemical screening of various extracts of *Tephrosia uniflora*

Chemical tests	*Tephrosia uniflora* leaf extracts			
	Pet ether	Chloroform	Ethanol	Water
Proteins and Aminoacids	-	-	-	-
Carbohydrates	-	-	+	+
Steroids	-	-	-	-
Phenols	-	-	+	+
Saponins	-	-	-	-
Flavonoids	-	-	+	+
Alkaloids	-	-	+	+
Glycosides	-	-	-	-
Tannins	-	-	+	+

+: Indicates presence and –: Indicates absence

Table 4: Fluorescence analysis of powder leaves of *Tephrosia uniflora*

S. No.	Treatment	Day light	Short UV (254 nm)	Long UV \(366 nm)
1.	Powder	Green	Green	Green
2.	Powder+Water	Green	Light green	Light green
3.	Powder+1NHCl	Light green	Light green	Bluish white
4.	Powder+1NH_2SO_4	Pale green	Light green	Bluish green
5.	Powder+1$NHNO_3$	Pale yellowish green	Light green	Yellowish green
6.	Powder+Aceticacid	Dark green	Dark green	Red
7.	Powder+1NNaOH	Yellowish green	Light green	Dark green
8.	Powder+1N Alc.NaOH	Yellowish green	Light green	Dark green
9.	Powder+1NKOH	Green	Light green	Dark green
10.	Powder+1N Alc.KOH	Light green	Light green	Dark green
11.	Powder+Ammonia	Green	Light green	Dark green
12.	Powder+Iodine	Reddish brown	Dark green	Dark green
13.	Powder+$Fecl_3$	Brownish green	Dark green	Dark green
14.	Powder+Ethanol	Light green	Light green	Red

Table 5: Fluorescence analysis of various extracts of *Tephrosia uniflora*

S. No.	Extracts	Daylight	UV light	
			Short 254 nm	Long 365 nm
1	Pet ether	Green	Yellowish green	Reddish
2	Chloroform	Greenish black	Dark green	Reddish
3	Ethanol	Greenish black	Greenish black	Reddish
4	Water	Brownish black	Green	Greenish

Determination of Physicochemical Constants

The physico-chemical constants of *Tephrosia unifora* leaf parts were determined for loss of drying, Ash value, and Extractive value as per the method described in pharmacopoeias, and the results are mentioned in Tables 1 and 2.

Preliminary Phytochemical Screening of Extracts

Preliminary phytochemical investigations of extracts revealed the presence of different secondary metabolites. Ethanol and aqueous extracts indicated the presence of flavonoids, carbohydrates, alkaloids, phenols, and tannins, respectively. The result is given below in Table 3.

Fluorescence Analysis

The selected plant is made into a course powder, treated with the required chemical reagents, and observed under visible and ultraviolet rays; the results are given in Tables 4 and 5.

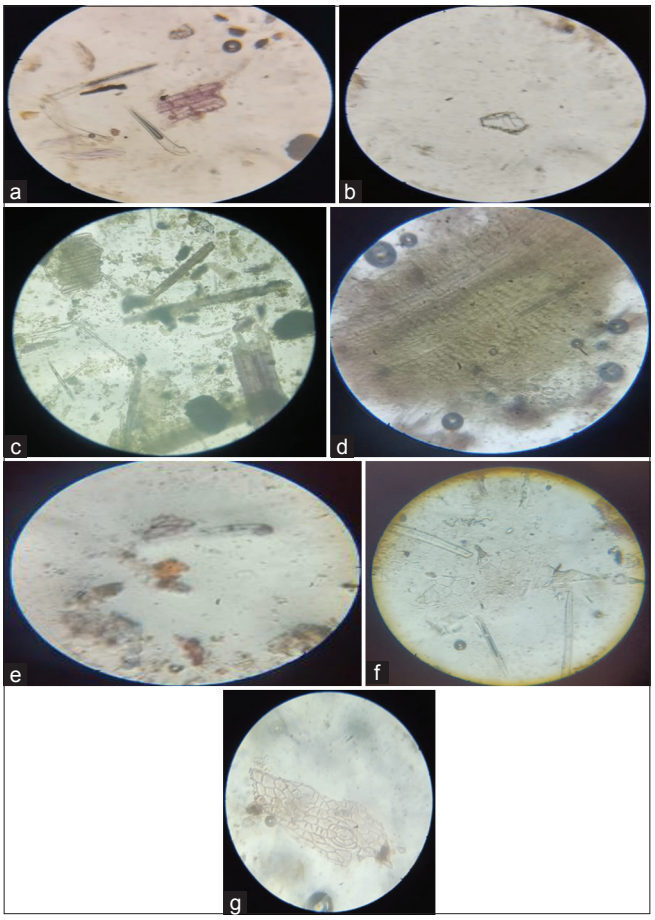

Figure 2: Powder microscopy of leaves of *Tephrosia uniflora* (a) Trichomes, (b) Calacium oxlate crystals, (c) Xylem vessels, (d) Lamina with vascular tissue, (e) Browinsh matter, (f) Epidermal cells alinged with stomata, (g) Epidermal cells with stomata

CONCLUSION

T. uniflora plant leaves were evaluated for pharmacognostic characterization, measurement of physiochemical parameters, and phytochemical screening of the crude extracts in the current study. The chosen plants were examined macroscopically and microscopically to confirm their authenticity and purity. As part of the usual procedure, physicochemical analyses such as ash value, acid-insoluble ash value, and extractive value were performed.

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