Pharmacognostical and Preliminary Phytochemical Studies of Tephrosia villosa (L.) Pers. (Fabaceae)

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***Abstract*—Tephrosia villosa, commonly known as Shwet sharpunkha, is an annual, gregarious, erect bushy herb belonging to the Fabaceae family. It's widely distributed in Southern Asia and throughout the plains of India. Historically, it's been used medicinally in various cultures, including treatments for diabetes and as a soil improver. The plant is known for its diverse phytochemicals and potential pharmacological activities. It is a medicinally significant bushy herb, growing 0.3–1.3 m tall in tropical/subtropical waste lands, and is well-known for its dense, whitish, or greyish apprised silky hairs covering its vegetative and reproductive parts. A detailed morphological study reveals that the stem is erect, branched, and densely hairy. The leaves are imparipinnately compound with rachis measuring up to 10 cm, featuring 7-19 leaflets that are obovate to elliptical, mucronate at the apex, with a cuneate base, glabrous above, and sericeous-villous below. The inflorescence is a terminal or axillary pseudo-raceme, often 8–22 cm long, characterized by paired, pink to rose-colored flowers. Floral characters include a calyx with dense matted hairs and a standard petal that is densely villous dorsally. The fruit consists of pods (legumes) which are characteristically linear, strongly curved (short-sword shape), 34 cm long, turgid, and densely covered in silvery-white or brown tomentose, silky hairs. This dense indumentum and specialized pod shape are key diagnostic morphological features for T. villosa, serving as a valuable marker in taxonomic standardization and identification. The study concludes that the morphology of T. villosa is distinctive and aids in its correct, precise identification for therapeutic uses.**

The preliminary phytochemical analysis is done from root, stem and leaves of the studied plant specimen but there is no any information about the seed Phytochemistry of Tephrosia villosa (L.) Pers., hence the present work is conducted and findings are communicated in this communication.[1]

***Index Terms*—Tephrosia Villosia (L.) Pers.(Fabaceae), fluorescence analysis, Quantitative determination, Pharmacognosy.**

I. INTRODUCTION

Tephrosia villosa, commonly referred to as Hoary Tephrosia, possesses significant medicinal and chemical properties. Traditionally, it has been used in the treatment of conditions such as dropsy, diabetes, stomach ache, fever, typhoid, skin diseases, and dental pain. From a chemical perspective, the plant contains important bioactive compounds including stigmasterol, lupeol, rotenone, and dehydrorotenone. The presence of rotenoids contributes to its insecticidal and pesticidal activities.

Medicinal plants have been an integral part of human healthcare since ancient times. Herbal medicines continue to be widely used in both developed and developing nations due to their broad therapeutic effects, relative safety, and cost-effectiveness. However, the effective use of these plants relies on

accurate identification and proper methods of extraction and processing.

In traditional Indian medicine, a single name may sometimes refer to multiple plant species, leading to confusion and misuse. To avoid such issues and ensure the selection of authentic drugs, the expertise of physicians and pharmaceutical professionals is essential. Pharmacognosy plays a crucial role in addressing these challenges by focusing on the identification, evaluation, and quality control of medicinal plants.

The present study is focused on the pharmacognostic evaluation of Tephrosia villosa (L.) Pers., a member of the Fabaceae family. The genus Tephrosia is a pantropical group comprising approximately 400 species worldwide (Gillett, 1971), with around 24 species reported in India (Gamble and Fischer, 1918; Saldanha and Singh, 1984). Most species in this genus are herbaceous or small shrubs that commonly grow as weeds.

This genus is known for its richness in prenylated flavonoids and exhibits a wide range of biological activities, including insect-repellent, larvicidal, piscicidal, antimicrobial, and anticancer properties (Sarin Jagat et al., 1976; Chen Yuh-Lin, 1978; Bentley et al., 1987). Tephrosia villosa is an erect, white, hairy, and sticky undershrub typically found in dry regions. It is locally known as “Poonai Kolinji” in Tamil.

Various parts of the plant are used in traditional medicine. Fresh roots are believed to have hypoglycemic effects, while leaf juice is used in the treatment of dropsy. Roots are also used in the preparation of herbal toothpaste. Additionally, the roots, leaves, and bark exhibit anthelmintic and antipyretic properties and are used in treating diseases related to the liver, spleen, heart, blood, and even leprosy. Root powder is commonly used to relieve stomach ache, and leaf juice is also reported to be beneficial in diabetes.

The plant is naturally distributed in deciduous forests across regions such as the Deccan, Carnatic, and Tamil Nadu. Despite its medicinal significance, there is limited pharmacognostic data available on this species. Therefore, the present investigation has been undertaken to study its pharmacognostic characteristics, which will help in ensuring the quality and authenticity of the raw drug. [1]

II. SYNONYMS AND REGIONAL NAMES

Tephrosia villosa (Family: Fabaceae) has been reported in scientific literature under several taxonomic synonyms such as Cracca villosa L., Tephrosia hirta Buch-Ham., Tephrosia incana Graham ex Wight & Arn., and Tephrosia argentea Pers. These different names are the result of historical revisions and reclassification within the genus over time.

The plant is widely distributed across various regions of India and is known by different vernacular names in local languages. In Telugu, it is called Nagurenpali; in Tamil, it is known as Poonai kolinji; and in Odia (Oriya), it is referred to as Setohdothiya. In certain parts of North and Western India, it is also commonly known as Sarphoka, Ran-neel, or Jungli neel, though these names may differ depending on the region. [2]

Taxonomy: -

- Kingdom: Plantae
- Phylum: Tracheophyta
- Class: Magnoliopsida
- Order: Fabales
- Family: Fabaceae (also known as Leguminosae)
- Subfamily: Faboideae
- Genus Subfamily: Tephrosia
- Species: Tephrosia villosa (L.) Pers. [3]

III. MICROSCOPICAL CHARACTERS OF TEPHROSIA VILLOSA

1. Leaflet: -

Microscopic evaluation of leaf anatomy provides essential diagnostic criteria for the identification and standardization of medicinal plants. In this context, the leaflet structure of Tephrosia villosa exhibits well-defined quantitative and qualitative features that are valuable for pharmacognostic characterization.

The leaflet is characterized by a prominent midrib and a thick lamina. The midrib is flat on the adaxial surface and rectangular on the abaxial side, measuring approximately 200 µm in thickness (vertical plane) and 250 µm in width (horizontal plane). It is covered by a thin epidermal layer composed of small, thick-walled cells. A single, prominent top-shaped vascular bundle is present, surrounded by a layer of dilated hyaline parenchymatous bundle sheath cells extending up to the adaxial epidermis. The vascular bundle consists of three to four vertical rows of angular, wide xylem elements and a thick horizontal band of phloem tissue, with a conical sclerenchymatous mass on the adaxial side and an arc-shaped sclerenchyma band on the abaxial side. The lateral veins exhibit a similar structural organization, with collateral vascular tissues and sclerenchyma caps on both surfaces.

The lamina is approximately 120 µm thick, with a 15 µm thick adaxial epidermis composed of wide, rectangular, thin-walled cells, while the abaxial epidermis consists of circular to squarish thin-walled cells. The leaflet is amphistomatic, bearing stomata on both surfaces. The mesophyll is differentiated into a well-developed adaxial region of three layers of elongated palisade cells and an abaxial region of two layers of shorter palisade cells, with a central zone of large, circular, hyaline spongy parenchyma cells.

The leaf margin is semicircular, measuring about 120 µm in thickness, and is composed of a wide epidermal layer with barrel-shaped or circular thick-walled cells. A small marginal vascular bundle with collateral arrangement and a parenchymatous bundle sheath is also present.

The inclusion of these detailed anatomical measurements and cellular features establishes a set of standard microscopic parameters for Tephrosia villosa, contributing to its accurate identification, authentication, and application in pharmacognostic and medicinal plant research. [4]

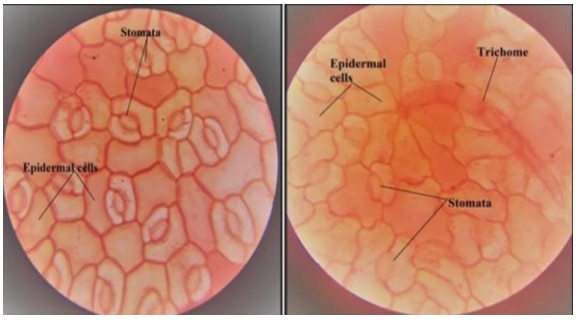
• Venation pattern: -

The study of venation patterns constitutes an important aspect of leaf microscopy, providing valuable diagnostic characters for plant identification and taxonomic evaluation. In Tephrosia villosa, the venation architecture exhibits distinct and well-organized features that are significant for pharmacognostic analysis.

The present section describes the detailed venation pattern of the leaflet, wherein the primary veins are thick and run parallel to each other, while the secondary and tertiary veins branch profusely to form a well-defined reticulate network. The vein islets are clearly distinguishable, displaying a characteristic polyhedral outline. Additionally, vein terminations are observed within some of the vein islets; these are typically unbranched and vary in length, appearing either long or short and slender.

Such structural attributes of venation serve as reliable microscopic markers and contribute to the accurate identification, standardization, and differentiation of Tephrosia villosa from related species.[5]

• Epidermal cells and stomata: -



The microscopic examination of epidermal characteristics and stomatal features is a fundamental aspect of pharmacognostic studies, as these parameters provide reliable criteria for plant identification and standardization. In Tephrosia villosa, the epidermal architecture and stomatal distribution exhibit distinct and diagnostically significant traits.

The present section focuses on the detailed morphology of epidermal cells and stomata. The epidermal cells are predominantly small and polygonal in surface view, with straight and thin anticlinal walls. Certain cells appear circular or angular with thickened, lignified walls, serving as basal cells for the origin of epidermal trichomes. Additionally, many epidermal cells show dense accumulation of mucilage, indicating specialized physiological adaptations.

Stomata are distributed on both adaxial and abaxial surfaces of the lamina, with a higher frequency on the abaxial side, indicating an amphistomatic condition. The stomata are mainly of the anisocytic type, characterized by three unequal subsidiary cells, while some are anomocytic, lacking distinct subsidiary cells. The guard cells are elliptic in shape with a wide stomatal pore, measuring approximately 15 × 20 µm, and the stomatal density is about 100 per mm².

These detailed epidermal and stomatal features provide important microscopic markers, contributing to the accurate identification, authentication, and quality evaluation of Tephrosia villosa in pharmacognostic and botanical studies. [6]

2. Rachis (Petiole)

The anatomical study of the rachis (petiole) provides significant insights into the structural organization and mechanical support system of leaves, serving as an important parameter in pharmacognostic identification. In Tephrosia villosa, the rachis exhibits distinct morphological and anatomical characteristics that contribute to its diagnostic value.

The present section focuses on the detailed microscopic features of both proximal and distal regions of the rachis. The proximal part is nearly circular in cross-sectional view, characterized by two prominent semicircular wings on the adaxial-lateral sides. It measures approximately 550 µm in vertical plane and 600 µm in horizontal plane. The outermost layer consists of a well-defined epidermis composed of radially elongated cells, followed by three to four layers of outer parenchymatous cells. The central ground tissue is made up of wide, angular, thin-walled parenchyma cells.

The vascular system is represented by a thick, continuous cylindrical arrangement of xylem, encircled externally by a thin layer of phloem. This vascular cylinder is further reinforced by a continuous sheath of sclerenchyma cells possessing gelatinous inner walls, providing mechanical strength. Additionally, the adaxial wings contain prominent collateral vascular bundles, each associated with a thick arc-shaped sclerenchymatous bundle cap.

These detailed anatomical characteristics of the rachis establish important microscopic standards for Tephrosia villosa, aiding in its identification, authentication, and further pharmacognostic evaluation.[7]

Distal part of the petiole: -

The anatomical study of the distal (terminal) region of the petiole provides important structural details that complement the overall pharmacognostic profile of the plant. In Tephrosia villosa, the distal petiole exhibits distinctive microscopic features that are useful for identification and comparative analysis.

The present section highlights the structural organization of the distal part of the petiole, which appears elliptical in cross-sectional view, measuring approximately 550 µm horizontally and over 700 µm vertically. It is composed of a well-developed epidermal layer, followed by about four layers of outer ground tissue, and a central region of compact, wide, angular parenchymatous cells.

The vascular system forms an elliptical cylinder with a characteristic adaxial gap and the presence of two small circular vascular strands. The vascular cylinder is surrounded by a three-cell-thick sheath of gelatinous

fibres, enclosing a continuous zone of phloem and closely arranged, thickwalled angular xylem elements. These anatomical features of the distal petiole provide valuable diagnostic markers and contribute to the establishment of standard microscopic parameters for Tephrosia villosa, supporting its accurate identification and pharmacognostic evaluation.[8]

3. Stem

The anatomical investigation of the stem is an essential component of pharmacognostic studies, as it provides critical diagnostic features for the identification and standardization of medicinal plants. In Tephrosia villosa, the stem exhibits distinct structural and cellular characteristics that are of considerable taxonomic and analytical significance.

The present section describes the detailed microscopic organization of the stem, which is unequally four-angled in cross-sectional outline and measures approximately 1.2 mm in thickness. The outer surface is densely pubescent, with a thin, continuous epidermal layer composed of small, square-shaped cells bearing abundant uniseriate trichomes. Beneath the epidermis lies the cortex, consisting of four to five layers of angular, thick-walled compact parenchyma cells, with uneven thickness due to the wavy contour of the underlying sclerenchymatous cylinder. This sclerenchyma occurs as thick, discontinuous arcs measuring about 30–50 µm in thickness.

The vascular cylinder is well-developed and continuous, enclosing a wide pith. It comprises outer discrete masses of phloem fibres arranged in a single ring, followed by a narrow zone of secondary phloem organized in radial rows. The xylem cylinder is uneven, with broad wedge-shaped segments and narrow radial files, consisting predominantly of xylem fibres and fewer vessels. The vessels are wide, angular, thick-walled, arranged in short radial multiples, and measure approximately 20–25 µm in diameter, while the fibres are lignified with wide lumens.

The central pith is composed of compactly arranged, wide, circular to angular parenchyma cells. Additionally, calcium oxalate crystals are sparsely distributed in the cortical region and around the sclerenchyma cylinder, serving as supplementary diagnostic features.

These comprehensive anatomical characteristics establish a set of standard microscopic parameters for Tephrosia villosa, facilitating its accurate identification, authentication, and application in pharmacognostic and botanical research.[9]

4. Root: -

The anatomical investigation of roots at different stages of development provides valuable diagnostic criteria for the identification and standardization of medicinal plants. In Tephrosia villosa, both young (thin) and mature (thick) roots exhibit distinct and progressive structural variations that are significant for pharmacognostic evaluation.

The present section describes the comparative anatomy of young and thick roots. The young root is characterized by a smooth, superficial periderm consisting of four to five layers of thin-walled phellem cells. The cortex is well developed, comprising 8–10 layers of large, tangentially elongated, thin-walled parenchyma cells, with the presence of scattered sclerenchyma cells. The central vascular region forms a dense, solid xylem core, containing both wide (40–50 µm) and narrow vessels, distributed diffusely. The xylem fibres are thick-walled and lignified, while a thin, continuous sheath of phloem surrounds the xylem cylinder.

In contrast, the thick root shows a more advanced and differentiated structure with a well-developed periderm measuring about 150 µm in thickness, composed of more than 20 layers of compressed, suberized phellem cells. Beneath this lies a thick, irregular sclerenchymatous cylinder, providing enhanced mechanical support.

The vascular system includes a thin, continuous secondary phloem cylinder enclosing a broad, dense secondary xylem cylinder, predominantly composed of fibres. The vessels are solitary and diffusely arranged, with wider vessels (approximately 70 µm) in the central region and narrower vessels (around 20 µm) towards the periphery. The xylem fibres are lignified and irregularly arranged, while prominent, straight xylem rays extend radially from the center to the periphery.

These detailed anatomical distinctions between young and thick roots establish reliable microscopic standards for Tephrosia villosa, contributing to its accurate identification, authentication, and application in pharmacognostic and botanical research.[10]

IV. MEDICINAL USES

i)Traditional Uses: -

The traditional uses of Tephrosia villosa highlight its importance in ethnomedicine. It is commonly used in India for treating stomach disorders, skin diseases, and dental pain, while in Ethiopia it is used for respiratory tract disorders. These uses indicate its therapeutic potential and support further scientific investigation.[20]

ii) Ayurvedic Uses: -

In Ayurvedic medicine, Tephrosia villosa is valued for its therapeutic applications in various ailments. It is traditionally used in the management of asthma, diarrhea, gonorrhoea, rheumatism, ulcers, and urinary disorders, reflecting its significance in classical herbal practices.[19]

iii) Chemical Uses:

- The chemical properties of Tephrosia villosa indicate its wide range of biological and industrial applications.
- The presence of rotenoids contributes to its pesticidal and insecticidal activity, making it useful as a fish poison and potential bio-insecticide.
- The plant exhibits significant antimicrobial, antidiabetic, and antioxidant properties.
- It is also recognized for its role as a green corrosion inhibitor, supporting ecofriendly applications.
- Important chemical constituents include stigmasterol, lupeol, rotenone, and dihydrocortisone, which are responsible for its pharmacological activities.
- The plant contains flavonoids and phenolic compounds that contribute to its anti-inflammatory and hepatoprotective activities, supporting its use in traditional medicine.
- Extracts of the plant show larvicidal and mosquito-repellent properties.

vi) Other Reported Uses:

Tephrosia villosa(L) is also believed to be effective in treating conditions like diarrhea, gonorrhoea, piles, spleen enlargement, and urinary disorders.

Specific Applications: -

The specific applications of Tephrosia villosa demonstrate its extensive use in traditional medicine for treating various ailments.

- Root powder and paste are used for the treatment of stomach ache, fever, and typhoid.
- Leaf extract is utilized in the management of edema.
- Leaf smoke is traditionally inhaled to provide relief from asthma.
- Root powder is also applied for dental problems.
- Seed powder is taken for conditions like plague.
- Seed paste is applied externally to relieve itching. Seed oil is used in the treatment of scabies, itching, and ringworm [19].

Important Considerations: -

The use of Tephrosia villosa requires careful consideration due to the presence of certain bioactive compounds.

Rotenone, a key constituent of the plant, can be toxic, especially when inhaled in high doses.

Therefore, despite its medicinal and chemical benefits, safe handling and controlled use of the plant are essential.

V. FLUORESCENCE ANALYSIS

Fluorescence analysis is an important pharmacognostic tool used for the identification and standardization of crude drugs. In the present study, the powdered samples of leaf, stem, and root of Tephrosia villosa were examined under ordinary light as well as ultraviolet (UV) light. The powders were also treated with various chemical reagents to observe characteristic colour changes, which aid in the detection of specific constituents.

The observations revealed distinct fluorescence behavior for different plant parts and their extracts. The methanolic extract of root powder exhibited a yellow colour in visible light and showed fluorescent yellow under UV light. The leaf powder treated with different reagents generally displayed green or dark green fluorescence under UV light, whereas the stem powder showed yellow to greenish-yellow fluorescence. These variations in colour and fluorescence provide valuable parameters for the authentication and quality control of the plant material. The detailed observations are presented in Table-1.[11]

S. No.	Treatment	Plant parts					
		Leaf		Stem		Root	
		Visible light	UV light	Visible light	UV light	Visible light	UV light
1.	Powder + acetone	green	dark green	yellow	greenish yellow	pale yellow	fluorescent yellow
2.	Powder + ethyl alcohol	green	dark green	yellow	greenish yellow	pale yellow	greenish yellow
3.	Powder + 50% H_2SO_4	green	dark green	pale yellow	yellow	yellow	dark green
4.	Powder + 1 N HCl	pale green	green	pale yellow	yellow	pale brown	yellow
5.	Powder + 1N NaOH	yellowish green	green	light yellow	greenish yellow	pale yellow	yellow
6.	Powder + 50% HNO_3	Pale green	green	yellow	green	pale yellow	dark green
7.	Pet – ether extract	yellowish green	green	yellow	greenish yellow	golden yellow	brown
8.	Benzene extract	yellowish green	green	yellow	yellowish green	light yellow	greenish yellow
9.	Chloroform extract	green	dark green	pale yellow	greenish yellow	brownish yellow	greenish yellow
10.	Methanol extract	dark green	green	yellowish brown	greenish yellow	brown	dark yellow
11.	Powder + H_2O	light green	green	colourless	yellow	pale yellow	yellow

T-1 Comparative Fluorescence analysis of leaf, stem and root of T. Villosa

VI. QUANTITATIVE DETERMINATION

Quantitative determination plays a vital role in the standardization and quality evaluation of crude drugs. In the present study, various physicochemical parameters of Tephrosia villosa were determined, including total ash, water-soluble ash, acidinsoluble ash, sulphated ash, water-soluble extractive value, and moisture content. These parameters provide essential information regarding the purity, identity, and quality of the plant material, particully in powdered form.

The obtained values serve as important standards for detecting adulteration and ensuring consistency in the crude drug. The results of these determinations are summarized in Table 2.[12]

S. No	Test	*Leaf*	*Stem*	*Root*
1.	Total ash	11.26	3.8	3.1
2.	Water soluble ash	7.5	2.5	4.7
3.	Acid insoluble ash	7.5	2.54	2.81
4.	Sulphated ash	4.45	2.02	2.5
5.	Moisture content	53.45	46.42	61.14
6.	Water soluble extractive	6.76	2.21	2.89
7.	Alcohol soluble extractive	8.5	4.25	3.75
Extractive value				
8.	Petroleum ether extract	6.6	6.1	6.0
9.	Benzene extract	7.9	5.8	6.1
10.	Chloroform extract	7.7	5.9	5.8
11.	Methanol extract	9.6	8.7	8.4

Table: 2 Comparative analysis of physicochemical characters of leaf, stem and root of Tephrosia villosa (L.) Pers.

VII. MATERIALS AND METHODS

The present study was carried out to evaluate the pharmacognostic and phytochemical characteristics of Tephrosia villosa. The plant material was collected from a natural habitat and authenticated using standard floras. Fresh plant parts such as leaf, stem, and root were preserved and used for detailed microscopic examination by preparing free-hand sections. The powdered samples of different plant parts were subjected to physicochemical analysis following standard procedures.[13]

Fluorescence analysis of the powdered drug was performed under ultraviolet light after treatment with various reagents to observe characteristic colour changes. Preliminary phytochemical screening and biochemical estimations, including proteins, phenols, starch, amino acids, and tannins, were carried out using established methods to identify the major constituents present in the plant.

Macroscopic evaluation revealed that the plant is a subshrub commonly growing in poor soil conditions. It possesses pinnately compound leaves with multiple pairs of leaflets, showing distinct morphological features such as variation in surface texture, venation, and shape. The flowers are typically pink and arranged in axillary inflorescences, while the fruit is a small, multi-seeded pod. These morphological characteristics serve as important diagnostic features for the identification of the plant.[14]

VIII. PRELIMINARY PHYTOCHEMICAL INVESTIGATION IN SEEDS OF TEPHROSIA VILLOSA

The extracts were subjected to find the occurrence of preliminary phytoconstituents present in it following the standard procedures described in the Practical Pharmacognosy by C.K. Kokate (1999) [14] and R. K. Khandelwal (2004) [15].

Preliminary phytochemical screening is done as follows

1. Detection of carbohydrates: The extract is dissolved in 5mL distilled water and filtered. The filtrates are used to test for the presence of carbohydrates. Molisch's test: 1mL of filtrate solution is treated with 2 drops of alcoholic alpha – naphthol solution in a test tube. 2mL of concentrated sulfuric acid is added on the side of the test tube. Formation of the violet coloured ring at the junction indicates the presence of carbohydrates.
2. Detection of proteins and amino acids Ninhydrin Test: To the extract, 0.25% w/v ninhydrin reagent is added and boiled for few minutes. Formation of blue-violet color indicates the presence of amino acids or protein.
3. Detection of alkaloids: The crude extract powder is dissolved in 2N Hydrochloric acid and filtered. The filtrate is divided into four portions to achieve the following tests.
4. Dragendroff's test: One filtrate portion is treated with Dragendroff's reagent (solution of potassium bismuth Iodide). Formation of red precipitate indicates the presence of alkaloids. [16]

5. Detection of flavonoids:-

- Alkaline reagent test: Extract sample is treated with a Few drops of sodium hydroxide solution. Formation of intense yellow colour, which becomes colourless on addition of dilute acid, indicates the presence of flavonoids.
- Shinoda's test: The alcoholic extract is treated with magnesium turning and concentrated HCl gives red colour which indicates the presence of flavonones.orange-red color indicates the presence of flavonols.

6. Detection of tannins: -

- Gelatin test: To the extract, 1% gelatin solution containing NaCl is added.

Formation of white precipitate indicates the presence of tannins.

7. Detection of diterpenes: -

- Copper acetate test: Extracts is dissolved in water and treated with a few drops of copper acetate solution; formation emerald green color indicates the presence of Diterpenes.

8. Detection of steroids and tri-terpenoids: -

- Libermann-Burchard test: The extract sample is dissolved in 2mL of chloroform in a dry test tube. 10 drops of acetic anhydride and 2 drops of concentrated sulphuric acid are then added. If the solution becomes red, then blue and finally bluish green in color, it indicates the presence of Steroidal nucleus while formation of purple or red color indicates the presence of triterpenoids. [19]

9. Detection of Saponins: -

 Froth test: Crude dry powder of extract is vigorously shaken with 2mL of distilled water and is allowed to stand for 10 min. If stable froth appears, it indicates the presence of Saponins.

10. Detection of cardiac glycoside: -

 Keller-Kiliani's test: A portion of dry extract is treated with 1mL of FeCl3 reagent (1 volume of 5% FeCl3 and 99 volume of glacial acetic acid). To this solution a few drops of concentrated H2SO4 is added. The presence of greenish blue color within few minutes indicates the presence of deoxy sugar of cardiac glycosides.[21]

The following results are found in Table 3, after the evaluation of extracts:

Sr. no	Phytoconstituents	Petroleum Ether extract	Chloroform extract	Acetone extract	Ethanolic extract	Aqueous extract
1	Alkaloids	++	+	+	++	+
2	Carbohydrates	-	+	+	+	+
3	Glycosides	++	+	-	+++	+
4	Flavonoids	++	+	-	+++	++
5	Phytosterols	-	+	-	++	-
6	Fixed oils and Fats	+	-	-	-	+
7	Saponins	-	-	-	+	+
8	Phenolic compounds and Tannins	+	+	+	+	+
9	Lignins	+	+	+	-	+
10	Proteins and Free Amino Acids	+	+	-	-	-
11	Gums and Mucilage	+	-	-	+	+

Table 3: Preliminary Phytochemical Screening of Tephrosia villosa (L.) Pers.

IX. RESULTS

All the seed extracts of Tephrosia villosa (L.) Pers., in different ferent solvents was subjected to preliminary phytochemical investigation. More number of phytoconstituents like alkaloids, Glycosides, flavonoids, phytosterols was found to be present in Ethanolic extract while Saponins, Proteins and Free Amino Acids and Gums and mucilage in trace amount in rest of the extracts.

X. CONCLUSION

Phytochemicals found present in seed extracts of Tephrosia villosa (L.) Pers. Indicates their potential for preparation of novel medicines due to the occurrence of phytoconstituents. furthermore, isolation purification and characterization of the phytochemicals found present will make interesting studies.[21]

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