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Pharmacognostic and Phytochemical Investigation of *Tephrosia villosa* (L.) Pers.

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Abstract

Papillionaceae one of the subfamilies of family Fabaceae include about 375 genera. In India it is represented by many important genera commonly found in hills and plains. Most of the plants are herbs and climbers and very rare tree species are found. The plant *Tephrosia villosa* (L.) Pers. is a medicinally important and the fruits are edible. Systematic and detailed Pharmacognostic studies were performed on *Tephrosia villosa* (L.) Pers. The studies include morphological and anatomical characters of leaf, stem and roots and quantitative microscopy. Preliminary phytochemical analysis of the extracts was done and the results showed that alkaloids, glycoloids, carbohydrates and phenols and terpenoids were predominantly present in all the form of extracts of leaf, stem and root.

***Key words*:** Pharmacognostic, Phytochemical, *Tephrosia villosa,* Papillionaceae

A utilization of plant derived drug is being increasing throughout the world due to realization of reliability of crude drugs and drawbacks of allopathic drugs. Various indigenous drugs are used in single or in combination with other drugs for the treatment of different types of common and severe ailments. India is treasure house of such drugs. According to World Health Organization, about 80% of total world's population relays on medicines of herbal origin [1]. These drugs are being used by traditional people with less or no scientific knowledge of the plants. So, it is need of time to study these drugs scientifically [2].

Tephrosia is a well-known genus of the family Fabaceae comprises more than 400 species distributed in the tropical and subtropical regions of the world [3]. Many species including *T. purpurea, T. villosa, T. bracteiolata, T. calophylla, T. vogelii* etc. are used for the antifungal, antiviral, antiulcer, antidiabetic, antidiarrheal, antihepatotoxic, wound healing and other treatments [4]. Various species of *Tephrosia* have been studied widely in different parts of the world with their different parameters. It includes morphological and anatomical study [5], antidiabetic, antioxidant and antimicrobial studies [6], genetic characterization [4], phytochemical studies [1], [3], antihepatotoxic activity [7], gastro-protective effects [8], pharmacological aspects [9], anthelmintic effects [10] etc.

Tephrosia villosa is commonly known as *Shwet sharpunkha* is an annual, gregarious, erect bushy herb, which is widely distributed in Southern Asia, and in India throughout in plain. Literature survey reveals that, it is medicinally very important due to the presence of various phytochemicals. In India, it is recommended on the treatment of diabetes mellitus and in Africa, the herb is used as green manure to improve the fertility of soil [11]. In the present paper, author took efforts to study pharmacognostic and phytochemical analysis of the plant which is grown widely in Nashik district.

MATERIALS AND METHODS

For the successful confirmation of the present work author adopted standard methods given by the well-known researchers in the field.

Collection, authentication and preparation of plant material

The fresh Aerial part collected from Nandgaon College campus. The plant was authenticated by local flora and with consulting local taxonomists.

Pharmacognostic studies

Morphological and anatomical study of the plant: Plant was brought into the laboratory and detailed morphological studies were undertaken for the identification of the plant. For the purpose local floras were used. Anatomical study of the plant was undertaken by some standard methods [12] and Metcalfe and Chalk [13].

Quantitative microscopy

All the parameters like Stomatal number, Stomatal index, Palisade ratio, vein is-let, vein termination number, etc. were studied by using some standard methods provided by, Salisbury [14].

Phytochemical tests

For the detection of the major chemical groups, phytochemical analysis was performed using different techniques mentioned by Herborne [15], Kokate *et al*. [16]. It includes quantitative detection of the starch, Proteins, fats, phenols, tannins, terpenoids, terpenes, alkaloids, flavonoids, saponins, glycosides etc. Histochemical tests were performed on fresh plant material according to Harborne.

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RESULTS AND DISCUSSION

Macroscopic studies

An annual or perennial bushy herb (Fig 1), Stem are white velvety. Stem is densely hairy with white or greyish depressed hairs. Leaves imparipinnately compound with 7-19 leaflets, up to 10 cm long; stipules 2-5 mm long; leaflets obovate to elliptical, up to 21 mm × 9 mm, hairy on both sides, each side with 4-8 pairs of distinct veins. Stipules are lance shaped, and fall off. Flowers are borne in a terminal or upper axillary raceme 8-22 cm long; flower-stalk with densely matted hairs, 2-4 mm long; calyx densely matted-hairy, tube about 2 mm long, lobes long-acuminate, to 9 mm long; standard transversely elliptical to broadly ovate, up to 7 mm × 10 mm, dorsally with dense brown hairs. Style glabrous, up to 3-5 mm long, bent sharply upward at base, twisted, penicillate. Pod is strongly curved, up to 4 cm × 6 mm, densely silvery or brown-tomentose, hairs to 2 mm long, 4-10-seeded. Seed are 12-16, rectangular, black, smooth, with short hard excrescences, up to 4.5 mm × 2.5-2.75 mm.

Fig 1 Morphology of *Tephrosia villosa*

Microscopic studies

The anatomical study of fresh plant of *T. villosa* has been carried out by using standard methods. Transverse section of the root shows broad outer layer, periderm. It is made up of 4 or 5 thin-walled phloem cells. Cortical tissue is made of 3-4 oblong cells and comparatively narrow. Xylem cylinder is surrounded by broad secondary phloem. Secondary xylem contains thick discontinuous patches of gelatinous fibres, inner to which intact phloem elements are present. Vessels of xylem has vessels which are broad at periphery and narrow at centre.

Stem is quadrangular in shape having epidermis made up of single layer of small, unequal polygons cells that fit closely together. A thick cuticle covers epidermal layer and prevents transpiration. Primary cortex is made of 3-4 thick collenchyma layers of unequal polygon cells. Epidermis is followed by hypodermis of 4-5 parenchymatous cells. Endodermis is made up of polyhedron shaped cells which are larger than parenchyma cells. The pericycle is located between vascular bundles and endodermis and is made up of 3-4 layered polyhedron sclerenchyma cells. The vascular bundles are arranged around the pith which consists of outer proto-phloem and inner primary xylem. Pith is located at centre and made up of parenchyma cells with small intercellular spaces.

Transverse section of leaflet shows upper and lower epidermis. Epidermis is single layered and contains unicellular trichomes and covered by cuticle. Mesophyll cells contains upper palisade and lower spongy parenchyma cells. Spongy parenchyma is loosely arranged cells and contains air spaces and prismatic calcium oxalate crystals. Midrib shows vascular bundle covered by the ground tissue. Anomocytic stomata were seen on both surfaces. Open and collateral vascular bundles seen phloem present below xylem. Phloem contains phloem fibres and sieve elements. Xylem bundles composed of xylem parenchyma and fibres.

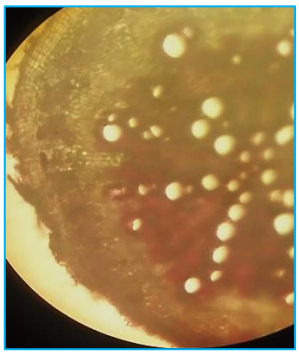

Fig 2 T. S. of root

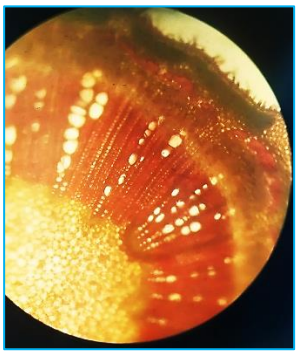

Fig 3 T. S. of stem

Fig 4 T. S. of leaf

Fig 4.1 Stomata on lower surface of leaf

Fig 4.1 Stomata on upper surface of leaf

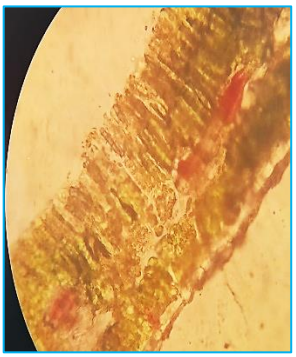

Fig 5 Palisade cell

Table 1 Quantitative microscopy of *Tephrosia villosa* leaf

Parameter	Surface	Reading
Type of stomata	Both	Anomocytic
Stomatal Number (Under one	Lower	33
microscopic field at 40x magnification)	Upper	31
Stomatal Index (Under one	Lower	20.7
microscopic field at 40x magnification)	Upper	20.1
Palisade ratio	-	1: 3
Vein Islet number	-	42.0/mm^2
Vein termination number	-	25.3/mm^2

Quantitative microscopy of leaf

The quantitative microscopic study of the leaf was undertaken by adopting standard methods. It was observed that, leaf contains anomocytic stomata having stomatal number (under one microscopic field at 40x magnification) 33 at lower surface of leaf and 31 at upper surface of leaf. Stomatal index was 20.7 at lower surface of leaf and 20.1 at upper surface of

the leaf. Nearly similar results have been recorded by Radhika and Tahira [11]. Palisade ratio was 1:3. Vein Islet number was 42.0 per sq. mm and Vein termination number was 25.3/sq.mm. Results are given in (Table 1).

Preliminary phytochemical study of the stem has been undertaken. Tests for alkaloids, carbohydrates, glycosides, flavonoids, phenols and were positive. Tests for saponins, phytosterols and proteins were negative.

CONCLUSION

Pharmacognostic and phytochemical studies of *Tephrosia villosa* reveals that, plant is medicinally very important and being used and can be used in various drug formulations. But due to uncontrolled manmade activities the plant widely growing at barren lands getting vanished from its natural habitats. So, it is urgent need to take serious efforts for the conservation of the plant.

Table 2 Preliminary phytochemical screening

Chemical constituent	Water extract test
Alkaloids	+
Carbohydrates	+
Glycosides	+
Saponins	-
Phytosterols	-
Flavonoids	+
Phenols	+
Proteins	-
Terpenoids	+

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