

The Pharmacognostic Evaluation of Leaves of Medicinal Plants *Tephrosia villosa* and *Cassia Tora* (Linn.)

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Abstract

Medicinal plants *Tephrosia villosa* and *Cassia tora* (Linn.) are belongs to the family Fabaceae and widely distributed in India and other tropical regions. Different parts (roots, stem, leaves and seeds) of the both plants have been used in various traditional medicare systems for ailments of human being. In the present study deals with the evaluation of pharmacognostic parameters in terms of the macro and micro-morphological characters and quantitative profiles of the leaves of *Tephrosia villosa* and *Cassia tora* (Linn.). The observations of the current study can be useful for identification, standardization and authentication of plants.

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Introduction

The nature has provided us depositories of medication to cure all ailments of humans. The traditional herbal medicines are still utilized in rural and tribal area of our country. The traditional herbal medicines are still utilized by a large part of community and conventional practitioners, who depends on natural medication for their primary healthcare system [1]. According to the World Health Organization, the macroscopical and microscopical description of a medicinal plant is the first step towards establishing the identity and degree of their purity [2]. *Tephrosia villosa* is commonly known as Ruvali-biyani and Kharanio. This plant is an annual, gregarious, erect bushy herb, up to 9 cm high which is widely distributed in Southern Asia, and in India throughout in plain [3]. It is very useful plant due to the presence of various phytochemicals. Aqueous extract of *T. villosa* leaves is used as herbal remedy in the treatment of diabetes mellitus in India. In Africa, the herb is used as green manure to improve the soil[4]. *Cassia tora* Linn. is commonly known as Foetid Cassia, Tora, Sickle Senna, Wild Senna, Sickle Pod, Coffee Pod, Tovar, Chakvad and Ringworm Plant. It is also known as Charota and Chakvad in Hindi, Chakramarda & Dadmari in Sanskrit[5]. It is an annual fetid herbaceous plant which is widely distributed in India, Ceylon, China and other tropical countries. Different parts of plant *Cassia tora* are widely used to cure various diseases like skin diseases, eye diseases, liver diseases etc.[6]. The present studies were carried out to determine the macro and micro-morphological characters, and quantitative parameters to evaluate pharmacognostic properties of the leaves of *Tephrosia villosa* and *Cassia tora* Linn.

Material and Methods

Collection and Authentication of Botanical Material

Fresh leaves of *Tephrosia villosa* and *Cassia tora* (Linn.) were collected from the local area around Ajmer, Rajasthan (India). A herbarium specimen of each plant has been deposited at the Department of Botany, Samrat Prithviraj Chauhan Government College Ajmer.

Preparation for Examination

Collected fresh leaves of plants *Tephrosia villosa*

and *Cassia tora* (Linn.) were washed with water and cleared of foreign matter and other contaminants. Microscopic evaluation was done by using standard methods.

Chemicals

The chemicals like lactic acid, trichloroacetic acid, phenol, safranin, glycerine, distilled water etc. were used. The entire chemical, used in experiments were of analytical grade.

Macroscopic Examination

The fresh leaves of both plants were evaluated for various organoleptic parameters such as the shape, size, colour, margin, texture, apex, presence or absence of petiole, phyllotaxy etc.

Microscopic Examination

The histological features such as structure of epidermal cells, structure, distribution and type of stomata, structure and distribution of trichomes on the fresh leaves have been analyzed.

Quantitative Microscopy

For the quantitative microscopy the number of epidermal cell, number of stomata and stomatal index for both abaxial and adaxial surfaces of the leaves were determined according to method of Mohan Ram and Nayyar[7] with slight modifications. Entire fresh leaves were soaked in the mixture of trichloroacetic acid and phenol in the proportion of 2:1 for 15-60 min at 60°C temperature. The cleared leaves were flooded with pure lactic acid and kept at 60°C temperature for various time periods and were then washed with water. Cleared leaves were stained with safranin, mounted with glycerin and observed under compound microscope. The quantitative estimations were carried out by using methods of Salisbury (1927); [8]; [9]; [10]

Epidermal cell number: The average number of epidermal cells per square millimeter unit of epidermis is termed as epidermal cell number.

Stomatal number: The average number of stomata per square millimeter of epidermis is termed as stomatal number.

Stomatal index: The percentage of number of stomata to the total number of epidermal cells (wherein

each stomata also is considered to be a single epidermal cell), is termed as stomatal index. The stomatal Index was calculated using the standard formula given below.

$$\text{Stomatal Index (S.I.)} = \frac{S \times 100}{S + E}$$

S = quantity of stomata per unit area and E = number of ordinary epidermal cells in the same unit area [11][12].

The quantitative parameters have been subjected to statistical analysis and expressed as Mean \pm SEM.

Results and Discussion

Macromorphology

The results of the macroscopic and organoleptic examination established that the plant *Tephrosia villosa* is an annual gregarious, erect bushy herb. Stem and branches angular, densely hairy with white appressed hairs. Leaves cauline and ramal, odor less, pinnately compound (imparipinnate), stipulate (free lateral). Leaflets alternate/opposite/ superposed, sessile, entire margin with dense hairs, oblanceolate in shape, apex emarginate, 10-14, pale green, more or less glabrous on upper surface and densely hairy on lower surface, having reticulate unicostate venation. Trichomes (hairs) are unicellular with glandular base. Figure 1.

The results of the examination reveals that the plant *Cassia tora* (Linn.) an annual herbaceous malodorous herb or under shrub. Stem is cylindrical, branched and grows in rainy season. Leaves cauline and ramal, pinnately compound (paripinnate), stipulate (free lateral). Leaflets are alternate/ Opposite/Superposed, numbers are 6, Obovate, entire margin with dense hairs, apex obtuse, dark green on adaxial surface and light green on abaxial surface, glabrous on adaxial surface and some trichomes are present on abaxial surface, conical shaped gland present at the base of lower leaflet. Terminal leaflet are larger than lower leaflet with dimension 10.29 ± 0.95 and 4.07 ± 0.23 respectively and having reticulate unicostate venation. Trichomes are unicellular. Figure 2, Table 1.

Micromorphology

The results of the micromorphology reveal that the leaves of *Tephrosia villosa* consists of amphistomatic

type of stomata (stomata found equally upon the both surfaces). The epidermal peeling of both adaxial and abaxial surfaces of leaves consists of small polygonal, thin walled epidermal cells and paracytic stomata which were surrounded by 2 or 3 subsidiary cells on either side of the guard cells and were parallel to stomata. Trichomes were absent on adaxial surfaces. Dense, white, silky and unicellular trichomes with glandular base were present on adaxial surface and leaf margin. Figure 3.

The results of the micromorphology of the leaves of *Cassia tora* are that stomata were present more on upper surface and less on its lower surface. The epidermal peeling of both adaxial and abaxial surfaces of leaves consists of small polygonal, thin walled epidermal cells and paracytic stomata which were surrounded by 2 or 3 subsidiary cells on either side of the guard cells and were parallel to stomata. Trichomes were absent on upper surface. Dense, unicellular trichomes were present on entire margin where few trichomes present on lower surface. Figure 4.

Quantitative Microscopy

The quantitative analysis shows that the number of epidermal cells is 78.5 ± 0.57 and 69.7 ± 0.83 , stomata number is 13.9 ± 0.5 and 15.5 ± 0.36 , stomata index is 15.02 ± 0.50 and 18.19 ± 0.4 for adaxial and abaxial surfaces respectively for the leaves of *Tephrosia villosa*.

The results of quantitative analysis of leaves of *Cassia tora* (Linn.) reveals the number of epidermal cells is 51.4 ± 0.7 and 50.7 ± 0.5 , stomata number is 12.1 ± 0.5 and 10.1 ± 0.37 , stomata index is 19 ± 0.49 and 16.59 ± 0.53 for adaxial and abaxial surfaces respectively. Table 2, Figure 5.

Conclusion

The pharmacognostic profile in terms of macro and micro-morphological characters of the leaves of *Tephrosia villosa* and *Cassia tora* (Linn.) can be useful in identification, standardization and authentication of raw material. The various parameter studied during the present analysis will also be helpful in quality assessment and detection of adulterants in the herbal

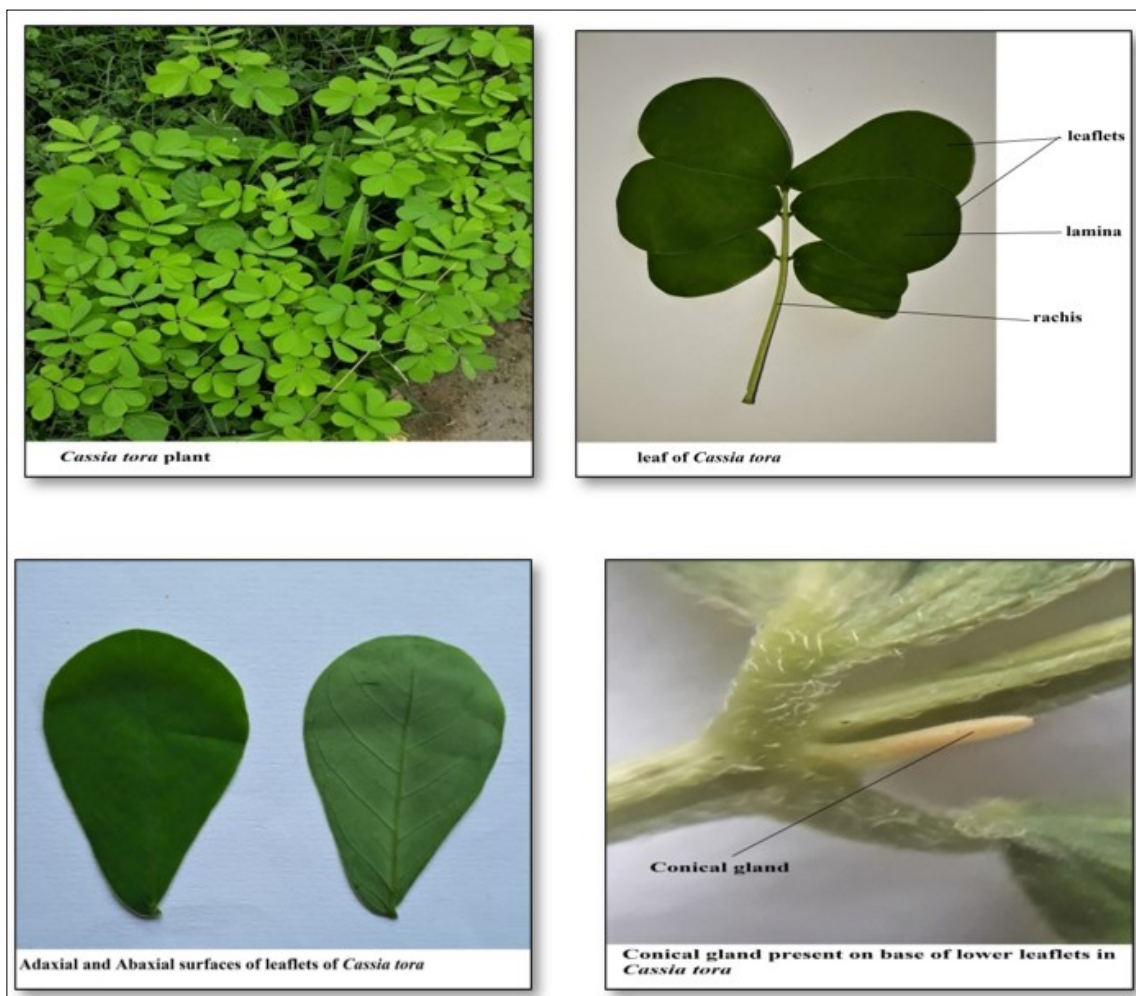


Table 1. Organoleptic Parameters.

| S.No. | Parameters | <i>Tephrosia villosa</i> | <i>Cassia tora</i> (Linn.) |
|-------|--|---|--|
| 1. | Bearing of leaf | Cauline and Ramal | Cauline and Ramal |
| 2. | Odour | Obnoxious/ displeasing | Obnoxious/ displeasing |
| 3. | Leaf type | Pinnately Compound / Imparipinnate | Pinnately Compound / Paripinnate |
| 4. | Glands at leaf base | Absent | Conical shaped gland present at the base of lower leaflet |
| 5. | Phyllotaxy of leaflets | Alternate/Opposite/ Superposed | Alternate/Opposite/ Superposed |
| 6. | Outgrowths at base of leaf | Stipulate/ Free lateral | Stipulate/ Free lateral |
| 7. | Colour of leaf-let (adaxial surface) | Pale green | Dark green |
| 8. | Colour of leaf-let (abaxial surface) | Pale green | Light green |
| 9. | Petiole (of each leaf-let) | Absent/sessile | Petiolate (very short) |
| 10. | Number of leaflet | 11-17 | 6 |
| 11. | Composition of lamina (of each leaf-let) | | |
| a. | Shape | Oblanceolate | Obovate |
| b. | Dimension (l*b) | 1.80±0.07 | 10.29±0.95/4.07 ±0.23 |
| c. | Margin | Entire with dense hairs | Entire with dense hairs |
| d. | Apex | Emarginate | Obtuse |
| e. | Surface appearance | Glabrous on upper surfaces and Dense trichomes are present on lower surface of leaflets | Glabrous on upper surface and Small amount of trichomes are present on lower surface of leaflets |
| f. | Trichomes | Unicellular with glandular base | Unicellular |
| g. | Venation | Reticulate/Unicostate | Reticulate/Unicostate |

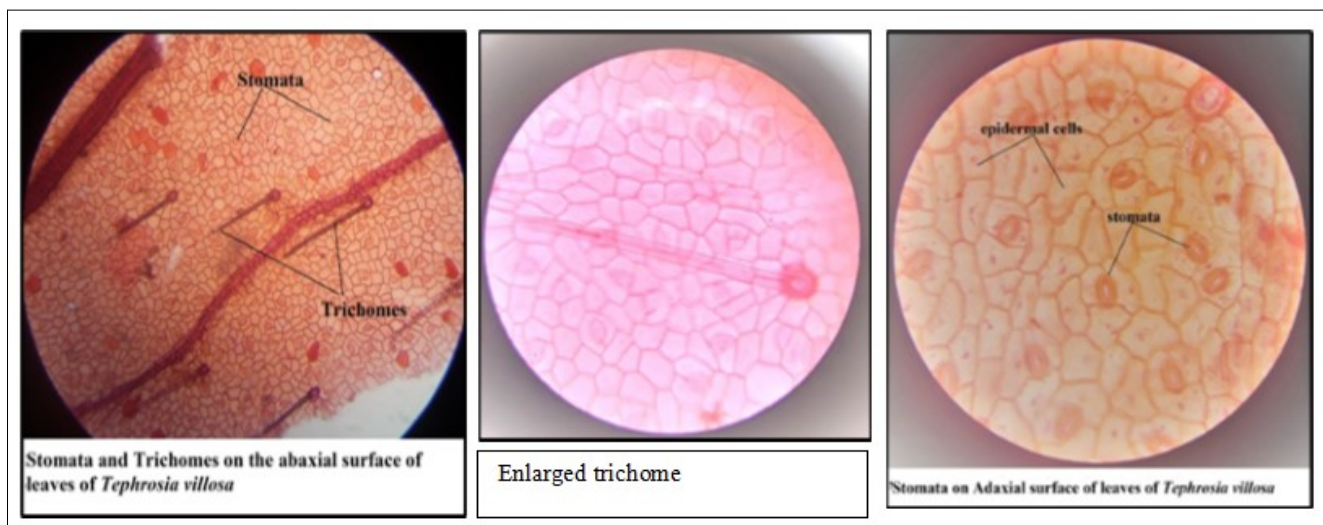


Figure 3. Micromorphology of leaves of *Tephrosia villosa* (abaxial surface and adaxial surface)

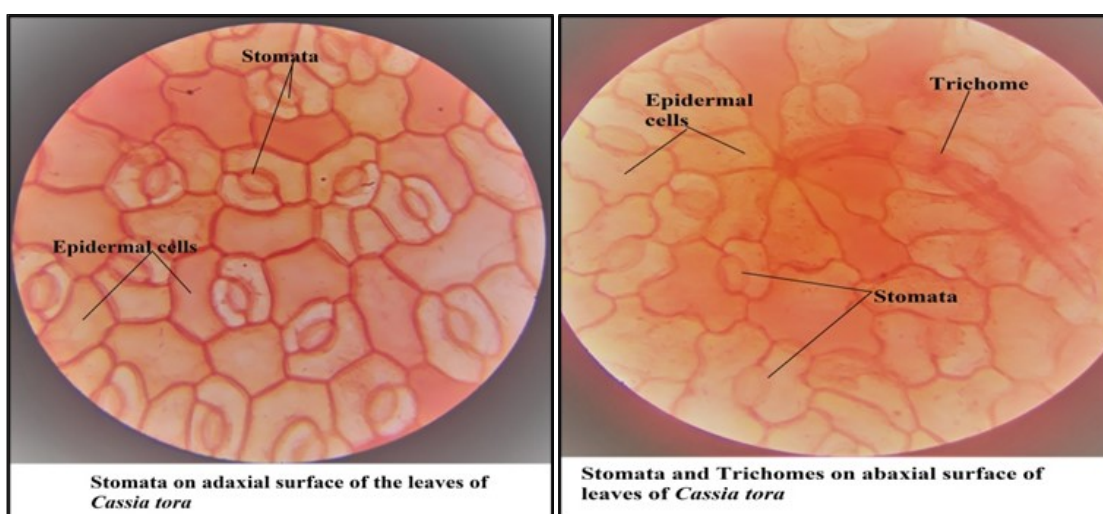


Figure 4. Micromorphology of leaves of *Cassia tora* (adaxial surface and abaxial surface)

Table 2. Quantitative Parameters

| S.No. | Parameters | <i>Tephrosia villosa</i> | <i>Cassia tora</i> (Linn.) |
|-------|--|--------------------------|----------------------------|
| 1 | Stomata number on adaxial surface | 13.9±0.5 | 12.1±0.5 |
| 2 | Stomata number on abaxial surface | 15.5±0.36 | 10.1±0.37 |
| 3 | Epidermal cell number on adaxial surface | 78.5±0.57 | 51.4±0.7 |
| 4 | Epidermal cell number on abaxial surface | 69.7±0.83 | 50.7±0.5 |
| 5 | Stomatal index on adaxial surface | 15.02±0.50 | 19±0.49 |
| 6 | Stomatal index on abaxial surface | 18.19±0.4 | 16.59±0.53 |

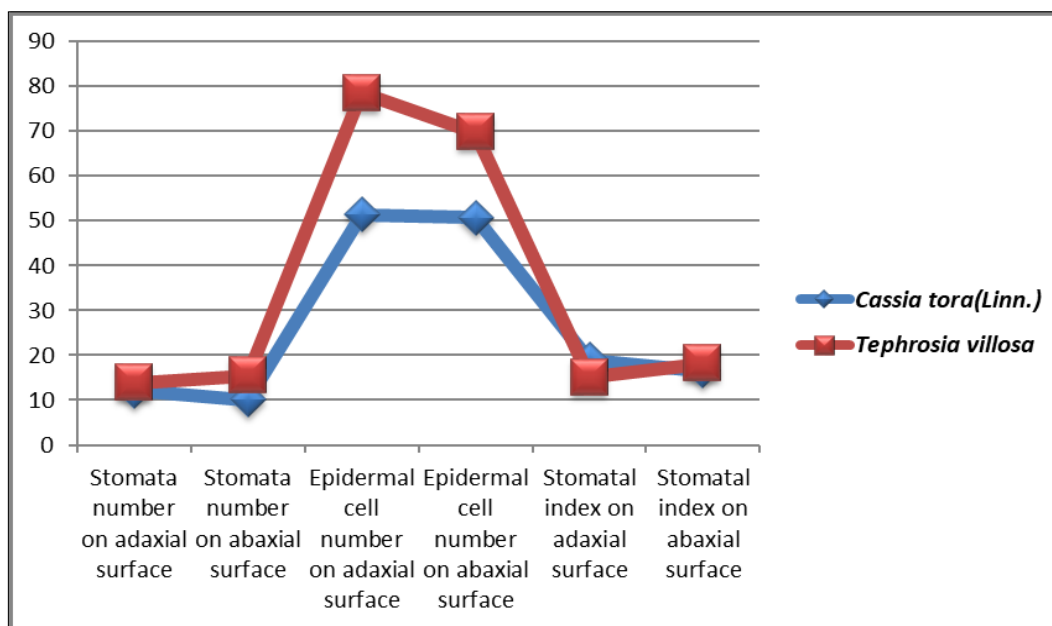


Figure 5. On X-axis- parameters and on Y- axis mean value of observed data

material used by various pharmaceutical companies.

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