PHARMACOGNOSTIC AND PHYTOCHEMICAL INVESTIGATIONS OF THE LEAVES OF *TECOMA STANS* LINN

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ABSTRACT

Establishment of Pharmacognostic profile of the leaves will assist in standardization for quality, purity and sample identification. Evaluation of the fresh, powdered and anatomical sections of the *Tecoma stans* leaves were carried out to determine the macromorphological, micromorphological, numerical, fluoroscence analysis and phytochemical profiles. The leaf of *Tecoma stans* linn is compound leaf, alternate, ovate, entire, glabrous, decurrent base. The leaf is compound trifoliate leaf having apex is acute, ovate in shape, serrate margin, decurrent base, parallel pinnate types of venation, petiole is long, surface is glabrous, upper epidermis dark green in color, lower epidermis lighter in color with characteristic odour and bitter taste. In the microscopic studies, the leaves showed the presence of trichomes, collenchyma, vascular bundles, spongy parenchyma, palisade cells and stomata. Phytochemical evaluation revealed the presence of alkaloids, glycosides, carbohydrates; aminoacids and steroids. The investigations also included numerical and quantitative leaf microscopy. The results of the study could be useful in setting some diagnostic indices for the identification and preparation of a monograph of the plant.

Keywords: *Tecoma stans*, Pharmacognostic profile, Standardization, phytochemical investigation

INTRODUCTION

Tecoma stans also known as yellow elder (Figure 1) is an erect shrub or small tree up to 4 m tall. Leaves are opposite and imparipinnate. In India, it is known as Sonapatti in Tamil language, Pachagotla in telugu language and korenekalar in Kannada language[1]. Yellow elder has been used for a variety of purposes in herbal medicine. Its primary applications have been in treating diabetes and digestive problems. Extracts from *Tecoma stans* leaves have been found to inhibit the growth of the yeast infection[2]. Some drugs of plant origin in conventional medical practice are not pure compounds but direct extracts or plant materials that have been suitably prepared and standardized[3]. The World Health Organization (WHO) has recommended the use of arthemisinin derivatives from A*rtemisia annua* (Composite), a Chinese herb with established pharmacognostic data, as a first line drug in the treatment of malaria[4, 5]. Establishment of the pharmacognostic profile of the leaves of *Tecoma stans* linn will assist in standardization, which can guarantee quality, purity and identification of samples.

Figure 1: Plant photograph of *Tecoma stans* linn

MATERIALS AND METHODS

Fresh leaves of *Tecoma stans* were collected from M.L.Gandhi Higher Education Society of college campus in Modasa City. Identification and confirmation were done by Dr.Jahagir, Botanist, Sir P.T.Scince College, Modasa. Where voucher specimens were deposited with the number, 08/BMCPER/PH.

Macroscopy

The following macroscopic characters for the fresh leaves (Figure 2) were noted: size and shape, colour, surfaces, venation, presence or absence of petiole, the apex, margin, base, lamina, texture, odour and taste[6, 7].

Figure 2: Leaf macroscopy

Microscopy

The outer epidermal membranous layer (in fragments) were cleared in chloral hydrate, mounted with glycerin and observed under a compound microscope. The presence / absence of the following were observed: epidermal cells, stomata (type and distribution) and epidermal hairs (types of trichomes and distribution). The transverse sections of the fresh leaves through the lamina and the midrib as well

as a small quantity of the powdered leaves were also cleared, mounted and observed[8].

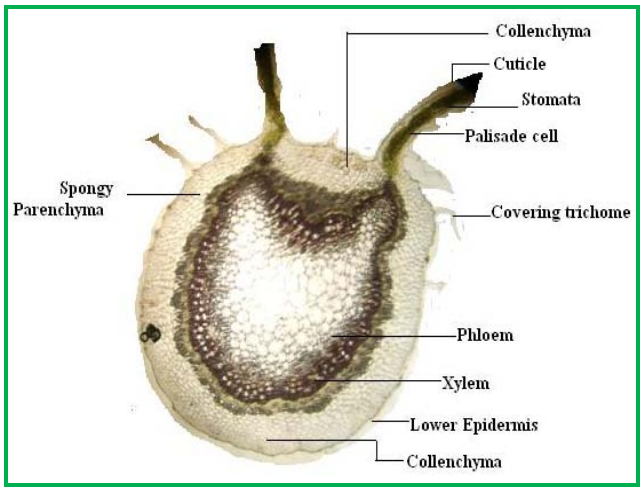

Figure 3: T.S of *Tecoma stans* leaf

Chemomicroscopic examination

Examination of the powder for starch grains, lignin, mucilage, calcium oxalate crystals, cutin and suberin were carried out using standard techniques.[6]

Phytochemical investigation

Chemical tests were employed in the preliminary phytochemical screening for various secondary metabolites such as tannins (phenazone; iron complex; formaldehyde and Modified iron complex tests), cardiac glycosides (Keller-Killiani and Kedde tests), alkaloids (Mayer's; Dragendorff's; Wagner's and 1% picric acid reagents), Saponin glycosides (frothing and haemolysis tests), anthracene derivatives (Borntrager's test for combined and free Anthraquinones) and Cyanogenetic glycosides (sodium picrate paper test)[6, 9, 10, 11.]

Quantitative investigation

Quantitative leaf microscopy to determine palisade ratio, stomata number, stomata index, vein islet number and veinlet termination number were carried out on epidermal strips. Other parameters determined for the powdered leaves were moisture content, total ash, acid insoluble ash, water – soluble ash, alcohol (90 % ethanol) and water soluble extractive values [12].

RESULTS

Macroscopically, the leaf of *Tecoma stans linn* is compound leaf, alternate, ovate, entire, glabrous, decurrent base. The leaf is compound trifoliate leaf having apex is acute, ovate in shape, serrate margin, decurrent base, parallel pinnate types of venation, petiole is long, surface is glabrous, upper epidermis dark green in color, lower epidermis lighter in color with characteristic odour and bitter taste. See in the table no. 1.

Microscopical features revealed that anticlinal walls are thin and wavy. There are two, three and sometimes four epidermal cells which are not different from each other surrounding the stoma (Anisocytic arrangement). Uniseriate covering trichomes are present on both surfaces, after epidermis chlorenchyma present. It is differentiated in to upper Palisade and lower spongy tissue. Transverse section of the leaf across the mid – rib shows xylem towards lower epidermal cells, which are highly lignified. Phloem towards lower epidermis. Powder microscopic examination of the leaves revealed the presence of covering trichome, stomata, xylem vessel and epidermal cell. Phytochemical evaluation revealed the presence of alkaloids, glycosides, carbohydrates, amino acids and steroids. These secondary plant metabolites are known to possess various pharmacological effects and may be responsible for the various actions of *Tecoma stans.* The leaf surface data, quantitative values and fluoroscence analysis values are presented in tables 2, 3, 4.

Table 1: Morphology of leaf of *T.stans*

Morphological parameter	Observation
Condition	Fresh
Type	simple or compound
Size: Length Width	12.5-13.5 cms 4.5-5.5 cms
Shape	Ovate
Apex	Acute
Margin	Serrate
Venation	Parella pinnate
Base	Decurrent
Petiole	Long
Surface	Glabrous
Phyllotaxy	Opposite
Color: Outer Inner	Dark green in color light green in colour
Odour	Characteristic
Taste	Bitter

Table 2: Leaf surface data of leaves of *Tecoma Stans*

S. No.	Parameter	Physicochemical constant
01	Total ash	10.35 %
02	Acid insoluble ash	11.05 %
03	Water soluble ash	06.07 %
04	Sulphated ash	14.0 %
05	Loss on drying	08.56 %
06	Alcohol soluble extractive value	20.1 % w/w
07	Aqueous extractive value	36.4 % w/w

Table 3: Quantitative leaf microscopy of *Tecoma stans*

S.No.	Parameter	Range	Mean
01	Palisade ratio	6.00 – 8.00	6.85 + 0.3841
02	Stomata number Upper surface	8.00 – 10.00	8.80 + 0.1864
03	Stomata number Lower surface	5.00 – 9.00	6.95 + 0.2348
04	Stomata index Upper surface	17.02 – 23.26	20.2785 + 0.4150
05	Stomata index Lower surface	13.95 – 17.65	16.0275 + 0.2617
06	Vein islet number	3.00 – 4.50	3.35 + 0.2915
07	Veinlet termination number	2.75 – 3.00	2.85 + 0.0612

Table 4: Fluorescence analysis of powder of *Tecoma stans*

S. No.	Treatment	*T. stans* leaves	
		UV short (254 nm)	UV long (365 nm)
01	As such	Light green	Dull green
02	Methanol	Green yellow	Dark green
03	Methanol:NaOH (1:1)	Green yellow	Dark green
04	Conc.H_2SO_4	Green black	Nil

DISCUSSION

Tecoma stans "Yellow elder" is currently being used in the treatment of various disease conditions without standardization. The standardization of a crude drug is an integral part of establishing its correct identity. Before any crude drug can be included in a herbal pharmacopoeia, pharmacognostic parameters and standards must be established. *Tecoma stans* is a plant that has been confused with other species due to their relative similarities. The results of these investigations could, therefore, serve as a basis for proper identification, collection and investigation of the plant. The macro and micro morphological features of the leaf described, distinguishes it from other members of the genera. Chemomicroscopy, numerical data and quantitative leaf microscopy are parameters that are unique to the plant and are required in its standardization.

CONCLUSION

These parameters, which are being reported for the first time, could be useful in the preparation of the herbal section of Indian Herbal Pharmacopoeia.

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