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Pharmacognostical and Phytochemical Investigations on Tecoma Stans Flower

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ABSTRACT

Establishment of pharmacognostic profile of the flowers of Tecoma stans will assist in standardization for quality, purity and sample identification. Evaluation of the fresh, powdered and anatomical sections of Tecoma stans flowers were carried out to determine macromorphological, micromorphological, physiochemical and phytochemical profiles. Pharmacognostical studies involve the anatomical sections and powder analysis of flower, physiochemical studies such as loss on drying, extractive values, ash values etc. were done. In phytochemical studies the flowers are extracted with different solvents and qualitative chemical tests for each extracts were performed only alkaloids are isolated and characterized in the other parts of this plant. From phytochemical screening of flower parts we can find out various other secondary metabolites and also characterization.

Keywords: Tecoma Stans, Pharmacognostical, physiochemical and phytochemical studies.

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INTRODUCTION

Herbal medicines are the use of herbs for their therapeutic or medicinal values and it is a major component of all traditional medicines. According to WHO, 80% of the population, presently use herbal medicines for their primary health care need. The herbal drugs are derived either from the whole plant or from different organs like leaves flowers, stems, bark, root etc. Some are prepared from excretory plant products such as gum, resins, and latex. Herbal medicines are in great demand in the developed world for primary health care because of their efficacy, safety and lesser side effects.¹

The *Tecoma Stans*, commonly known as Yellow elder or Trumpet flower of the family Bignoneaceae, is a small tree have a height up to 4to10meter.It has colorful flowers and its leaves are opposite and imparipinnate. The flowers of *Tecoma stans* are borne in terminal panicles. The calyx of the flower is green ,having a length of 5mm and is 5-toothed.The yellow corolla has a length of 4-4.5 cm .It is distributed throughout India, South America .This shrub has also become established in other tropical and sub-tropical areas such as in Africa, Asia, the Pacific islands and Australia. All most all the parts of *Tecoma Stans* are used traditionally for reducing blood sugar. Bark shows smooth muscle relaxant, mild cardiotoxic and chloretic activity. Applications include the experimental treatment of diabetes, digestive problems, control of yeast infections and other medicinal applications .From literature review it is clear that a little work has been done on standardization of *Tecoma Stans*. Establishment of pharmacognostic profiles of the flowers of *Tecoma Stans* will assist in standardization which can guarantee quality, purity and identification of samples. Only alkaloids are isolated and characterized in the other parts of this plant. From phytochemical screening of flower parts we can find out various other secondary metabolites and also characterization .⁶



Figure 1: Tecoma Stans

MATERIALS AND METHOD

Chemicals

Various chemicals used for this study were procured from Merck specialties pvt ltd.Mumbai, RFCL Ltd .New Delhi, Qualigens fine chemical, Mumbai.

Plant material

The *Tecoma Stans* plants flowers were collected from Jaipur National University, Jaipur and authenticated in department of Botany, Rajasthan University Jaipur by senior herbalist. Flower parts were separated from the *Tecoma Stans* plant then washed with water. Kept in sun light for 30 minutes and dried under shade room temperature. Made in to coarse powder and passed though sieve.

PHARMACOGNOSTICAL STUDIES^{9,10}**Macroscopical characteristics**

Macroscopical characteristics like shape, size, color, odor, taste and surface characteristics of flower were noted. This was carried out by naked eyes and with the aid of magnifying lens.

Microscopical characteristics

Longitudinal sections of flower parts were taken and one fine section was mounted and stained with saffranin dye and observed under microscope .The ovary and ovules are seen clearly. Examination of the flower powder was also carried out to find out the characteristics (like starch grains, calcium oxalate crystals and fatty substances) of flower powder. This was carried out using standard techniques.

Physiochemical evaluation

Physiochemical parameters like loss on drying, total ash, acid insoluble ash, water soluble ash, sulphated ash value, alcohol soluble and water soluble extractive values were determined.

Extraction

The shade dried coarse power of the flowers (25 gm.) was packed well in soxhlet apparatus and was subjected to continuous hot extraction with 99.5% of ethanol and then water until the completion of extraction. The extract was filtered while hot and was distilled under vacuum under reduced pressure and dried. Obtained extracts were weighed and the percentage yield was calculated in terms of air dried powdered crude material.

Preliminary phytochemical screening^{8,9,11,12}

The different qualitative chemical tests were performed for establishing the profile of the flower extracts for its chemical composition.

Detection of alkaloids-Mayer's test, Wagner's test, Hager's test

Detection of saponins by foam test

Detection of phytosterols -Liebermann-Burchard's test

Detection of tannins and phenolic compound-Ferric chloride test

Detection of flavonoids-Alkaline reagent test,Shinoda test

Detection of carbohydrate –Molisch test, Fehlings, Benedicts test

Detection of proteins and amino acids-Biuret test, ninhydrin test

ISOLATION OF PHYTOCONSTITUENTS^{9, 10, 14}

Column chromatography

Adsorbent : silica gel

Eluent : Petroleum ether to water in gradation

Ethanolic extracts : 3gm

Rate of elution : 15 drops per minute

Fractions collected: two fractions each of 20 ml

Each of the fraction were distilled and concentrated

UV absorption spectroscopy

The ultra violet visible spectrum of isolated fraction II was recorded

Solvent used : Chloroform

Wavelength : 200-400 nm

FT-IR spectroscopy

Fourier Transform Infra red spectrum of the one fraction obtained from the column chromatography of the ethanol extract of powdered flower of *Tecoma stans* was investigated for its characteristic functional groups.

Wave number 3500-60cm⁻¹

RESULTS AND DISCUSSION

A systematic approach is necessary in pharmacognostic study which helps in confirmation and determination of identity, purity and quality of a crude drug. This detailed and systematic pharmacognostic study will give valuable information for future research work.

Macroscopical studies

Macroscopical studies helps in the rapid identification of the plant material and is the primary step in the characterization of crude drugs. Macroscopical studies showed that the flowers are bell shaped and dark yellowish in colour. Odour is characteristic and taste is slightly bitter. Size of the flower is about 4-5 cm in length. Calyx of the flower is green, having a length of 5mm and is 5 toothed. The yellow corolla has a length of 4-4.5 cm and the tube is inflated upward. Stamens are fertile four didynamous and staminode. Gynoecium is bicarpellary, syncarpus, ovary superior, 2 locular, ovules numerous, stigma 2 lobed.

Microscopical studies

The microscopical study of the plant material mainly serves as an important diagnostic method in differentiation and identification of a particular plant species. L.S of flower found ovary and ovules with staining of saffron reser and starch grains, calcium oxalate crystals and fatty substances were observed in the flower powder using various reagents.(table no 1)

Physiochemical parameters

Determination of physiochemical parameters of a crude drug is essential as it helps in the identification and estimation of mishandling, adulteration and also setting of proper standards. Various physiochemical parameters like different ash values and extractive values on reaction with various chemical reagents were investigated and the results are presented in table 2.

Preliminary phytochemical screening

The phytochemical screening of various extracts obtained by extraction using soxhlet apparatus, the yields of various extracts were found as follows in table no 3. Qualitative chemical tests were conducted for all the extracts of flower of *Tecoma stans* to identify the various constituents and observations are recorded in the table 4. It was found that many secondary metabolites are present in the flower parts of *Tecoma stans* like flavanoids, alkaloids, carbohydrates, saponins, glycosides, phenolic compounds, tannins, terpenoids, steroids, fixed oils, fats, proteins and amino acids.

Characterization of fractions

Column chromatography

The alcoholic extract was subjected to column chromatography and obtained fractions were subjected to UV and I.R studies for the characterization of phytoconstituents. The colored fraction F15-F20 as fraction I, used for further study and the results were given in table 5

UV Spectra

The UV spectrum of isolated fraction I was recorded using double beam spectrophotometer. The sample solution was prepared in ethyl acetate and the same ethyl acetate was used as blank and UV scan was done between 200-400 nm. The spectral analysis data are in table 6

IR spectra

IR spectrum of the fraction I obtained from the column chromatography of the ethanolic extracts of powdered flower of *Tecoma stans* flower was investigated for its characteristic functional groups. The spectral analysis data are in table no 7. The results of IR spectra shows that there is a possibility for the presence of may be aromatic ring, alcoholic group and carbonyl group in fraction1.

Table 1: Study of flower powder with various reagents

Sl no	Reagents	Observations	Inference
1	Iodine solution	Blue color	Starch grains present
2	Lectochoral	Clearly observed calcium oxalate crystals	Calcium oxalate crystals present
3	Sudan red	Fatty substances are stained orange to red	Fatty substance present

Table 2: Physiochemical parameters

Sl no	Analytical parameters	%w/w
1	LOD	6.7
2	Ash values	4.4
(a)	Total ash	5.8
(b)	Acid insoluble ash	3.5
(c)	Water soluble ash	4.6
(d)	Sulphated ash	2.03
3	Alcohol soluble extractive	14.2
4	Water soluble extractive	8.7

Table 3: Extract values of powder flower of *Tecoma stans*

Extract	Yield(GM)	%w/w
Alcohol soluble extract	4.714	23.57
Water soluble extract	2.885	14.42

Table 4: Physiochemical parameters

Sl no	Chemical tests	Alcohol extract	Aqueous extract
1	Alkaloids	+	+
2	Carbohydrates	+	+
3	Saponins	+	+
4	Glycosides	+	-
5	Tannins/phenolic compound	+	-
6	Terpenoids	+	+
7	Flavanoids	+	-
8	Fixed oils and fats	+	+
9	Proteins& amino acids	+	+

Table 5: Column Chromatography of ethanolic extract of *Tecoma stans*

Sl no	No of fractions	Solvents/eluents	Colour of fraction
1	F1-F2	Petroleum ether (100%)	no
2	F3-F4	Petroleum ether: Benzene(50:50)	No
3	F5-F6	Benzene(100)	No
4	F7-F8	Chloroform: Benzene(50:50)	No
5	F9-F10	Chloroform (100%)	No
6	F11-F12	Chloroforme: Ethylacetate(50:50)	Colorless
7	F13-F14	Ethyl acetate (100%)	Colorless
8	F15-F16	Ethyl acetate: Ethanol(50:50)	Light yellow
9	F17-F18	Ethanol (100%)	Light yellow
10	F19-F20	Ethanol; Water(50:50)	Colorless
11	F21-F22	Water (100%)	No
12	F23-f24	Ethanol: water(50:50)	No
13	F25-F26	Water(100)	No

Table 6: UV spectrum of f-1

Fraction	λ max(nm)	Absorbance
Fraction 1	350	0.992

Table 7: Data table for IR Spectrum of F-1

Sl no	Frequency,cm-1	Bond	Inference
1	2912.31	C-H stretching	Alkane
2	2831.29	C-H stretching	Aldehyde
3	1315.25	C-N stretching	Aromatic ring
4	1151.33	C-O stretching	Tert. alcohol
5	615.09	C-H stretching	Aromatic ring

CONCLUSION

In the present study, flower of *Tecoma stans* of family Bignoniaceae was subjected to pharmacognostical, phytochemical and physiochemical study. In Pharmacognostic studies various parameters like macroscopical, microscopical study, loss on drying, ash values, extractive values etc were determined on the plant material. The loss on drying was found to be 6.7%.The ash values: total ash value, acid insoluble ash value, water soluble ash value and sulphated ash value was found to be 5.8%, 3.5%, 4.6% and 2.03% respectively. The alcoholic soluble extractive values (14.2% w/w) of the crude drug were found to be higher than water soluble extractive value (8.7%w/w).In the physiochemical studies, the flower of *Tecoma stans* was extracted by different solvents for various phytoconstituents present in the crude drug. The % yield of extraction with ethanol and water was found to be 23.57% and 14.42% w/w respectively. Qualitative chemical tests for each extracts were performed and it was found that many secondary metabolites are in the plant parts. The alcoholic extract contained one fraction F-I and UV and IR spectrum of this fraction was taken for the characterization of phytoconstituents and the spectra shows the presence of may be alkane, aldehyde, aromatic ring and tertiary alcoholic group.

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