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# EXPLORING PHARMACOGNOSTIC, PHYTOCHEMICAL, PHYSICOCHEMICAL PARAMETERS OF *TINOSPORA CARDIFOLIA*

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## ABSTRACT

Leaf is light green colour, bitter taste, heart shaped, length 8-12cm, width 7-11cm. Stem were greenish(fresh), brown(dry), slight characteristics bitter taste, cylindrical twisted in shape 0.5-6cm in diameter, smooth or rough and warty surface. Microscopic observations of leaf shows covering and glandular trichomes, single layer and straight upper epidermis where as single layer and wavy lower epidermis. Vascular bundle xylem and phloem, cambium, collenchyma. T.S. of stem show epidermis, cork, cortex, vascular tissue (xylem phloem), pith. Characteristics of stem powder: -Nature coarse powder, Colour Greenish-brown, Odour Slightly aromatic earthy, Bitter taste. Ethanolic soluble extractive value- 2.66%, water soluble extractive value- 3%, Total ash 5.33%, Water- soluble ash 6.34%, Acid- insoluble ash 1.16%, moisture content 2.03%, extract percentage yield 1.45%, phytochemicals screening reveals presence of Carbohydrates, alkaloids, glycosides tannin, proteins, flavonoids and saponin. TLC of ethanolic extract (Rf value 0.8,0.86,0.88).

**KEYWORDS:** Morphology, Microscopy, Physicochemical, phytochemical, Fluorescence analysis.

## 1. INTRODUCTION

*Tinospora cordifolia* is scientific name Giloy plant, it is also known as gaduchi, Amarbel, Amrita, etc. is the native herbal medicine of India. It is a woody climbing vine that grows faster with support from another plant like the Neem, Mango tree. It easily grows by its stem (fragmentation). *T. cordifolia* occurs throughout tropical regions of India, Bangladesh, Sri Lanka, Myanmar, China, Thailand, Philippines, Indonesia, Malaysia, Vietnam, North Africa, and South Africa. From ancient times, it has been usable as a traditional herbal medicine to stimulate immunity and hormones and used as an antioxidant, anti-arthritis, anti-diabetic, anti-asthma, anti-cancer, anti-toxic, anti-microbial and for chronic fever, weight loss, cardio protective. *Tinospora cordifolia* has been reported to possess a number of medicinal properties. Botanical extracts made directly from crude plant material show substantial variation in composition, quality, and therapeutic effects. Quality of a drug that is determined by identity, purity, content, and other chemical, physical, or biological properties, or by the manufacturing processes. An innovative research effort to define the advantage of the traditional system of medicine with respect to its safety and efficacy could result in a better utilization of these complementary systems of medicine. The main goal of this study was to provide standardized quality control parameters and to give a scientific validation to the phytoconstituents of *Tinospora cordifolia*.[1,2,3,4,5,6]

## 2. MATERIALS AND METHODS

### 2.1 Plant Collection and authentication

Fresh leaves and stem of *T.cardifolia* were collected from a local area in Prayagraj, Uttar Pradesh, India. The plant material was identified and authenticated by the Botanical Survey of India (BSI), Prayagraj, Authentication No.2025-26/ 55.

### 2.2 Macroscopic studies

Morphological studies were conducted through the evaluation of organoleptic characteristics, including color, odor, taste, texture, shape, and size. These features were carefully observed and assessed for botanical identification and analysis.[15,16]

### 2.3 Microscopic studies

Microscopic studies were carried out by cutting transversely thin sections of leaf & stem. The sections were mounted in glycerin water solution for further observations and specific microscopic diagnostic characteristics were point out. The powder characteristics were also carried out.[7,8,9]

### 2.4 Physicochemical parameters

The dried leaves powder of plant was taken and various physicochemical analysis viz., foreign matter, moisture content, extractive value, ash value was carried out and values are recorded.[10,11]

### 2.5 Phytochemical screening

100g powdered plant leaves crude drug powder was defatted with Pet. ether and then extracted with 95% ethanol in a soxhlet extractor. The liquid extract was concentrated & various qualitative chemical analyses were carried out and recorded.[12,13,14]

### 2.6 Thin layer chromatography

Alcoholic extract of *T. cardifolia* leaves were evaluated by TLC for the presence of phenolic compounds using chloroform: methanol: water (55:35:10) specific solvent systems and Iodine saturated chamber were used as visualizing reagents.[14,15]

## 3. RESULTS AND DISCUSSION

### 3.1 Macroscopical study

The macroscopic and organoleptic characteristics of the leaves include their color, odor, taste, shape, texture, margin, apex, and petiole. These features are essential for identifying and distinguishing plant species (See Figure 1 and Table 1). The color of the leaves varies, while their odor and taste may offer insights into their chemical composition. The shape and texture of the leaves whether smooth or rough, help in characterizing the plant, as do the margins, which may be smooth, serrated, or lobed. The apex (tip) of the leaf can be pointed, rounded, or notched, and the petiole (leaf stalk) can be long or short, contributing to the overall structure and identification.

**Fig. 1: *T. cordifolia* leaf and whole plant.**

**Table no. 1: Morphology of leaf.**

| S.No. | Features | Observations |
|---|---|---|
| 01 | Upper surface | Green |
| 02 | Lower surface | Light green |
| 03 | Odour | Earthy, woody |
| 04 | Taste | Bitter |
| 05 | Shape | Heart shaped |
| 06 | Size | Length8-12cm, width7-11cm. |

### 3.2 Microscopical study of leaves and Stem

Both epidermises were single layered, palisade cells were single layered on both the surface with thick cuticle. 3-5 layers of mesophyll were present. Vascular bundles were present in the mid region. Covering trichomes are present. Calcium oxalate crystals are prismatic. Anomocytic stomata with wavy subsidiary cells are shown in Table 2 and Figure 2. Thick walled single layered epidermis with Trichome was present. 2-4 layers of cork cell and polygonal lignified parenchyma cells surrounded to the vascular bundles. It consists of xylem vessels, tracheids and xylem fibers (see Table 3 and Figure 3).

**Fig. 2: T.S. of leaf.**

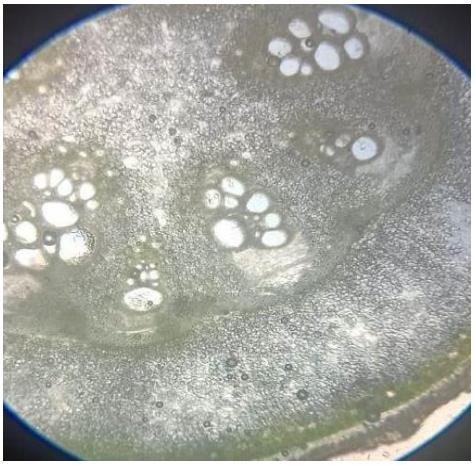

**Fig. 3: T.S. of stem.**

**Table No. 2: T.S. of leaf.**

| S.no. | Features | Observations |
|---|---|---|
| 1 | Trichome | Covering and glandular |
| 2 | Upper epidermis | Single layered, straight walled, |
| 3 | Lower epidermis | Single layered, wavy walled |
| 4 | Vascular bundle | Xylem and phloem, cambium |
| 5 | Collenchyma cells | Present |
| 6 | Parenchyma | Thin-walled, number of vascular bundles |

**Table No. 3: T.S. of stem.**

| S.no. | Features | Observations |
|---|---|---|
| 1 | Epidermis | Single-layered epidermis of rectangular cells. |
| 2 | Cork | Cork with thick walled brownish and compressed cells. Cork contains thin walled colourless, tangentially arranged cells. |
| 3 | Cortex | Cortex consists of chlorophyllous collenchymatous cells and inner zone has rounded parenchymatous cell in upper part and elongated parenchymatous cells in lower part. |
| 4 | Vascular tissue | Vascular zone is composed of wedge-shaped strips of xylem, externally surrounded by semi-circular strips of phloem. |
| 5 | Pith | Pith is composed of round to oval thin walled parenchymatous cells, loaded with starch grains. |

### 3.3 Powder Microscopy

The dark green, fine, odorless powder with a bitter taste appears to be derived from a plant material, possibly an herbal or medicinal plant. Microscopic examination of the powder reveals various structural elements, including trichome (hair-like structures), stone cells (which provide mechanical support), fibers (likely for structural integrity), vascular bundles (which transport water and nutrients), and tracheids (part of the plant's xylem, involved in water conduction). These features are indicative of a plant source with well developed anatomical structures, possibly used for its medicinal or therapeutic properties.

### 3.4 Fluorescence analysis

Fluorescence analysis involves the study of the fluorescence properties of a sample when it is exposed to ultraviolet (UV) light or other specific wavelengths of light (Shown in Table 4). In the case of plant powders, fluorescence analysis can help identify specific chemical compounds or detect contaminants and adulterants based on their unique fluorescence characteristics. When a sample like the dark green, odourless powder is subjected to UV light, it may exhibit a specific fluorescence pattern due to the presence of certain compounds, such as alkaloids, flavonoids, or other secondary metabolites. These compounds often fluoresce under UV light, revealing their presence and helping in the identification and authentication of the plant material. The intensity, color, and nature of the fluorescence can provide valuable information about the chemical composition of the sample, aiding in quality control and botanical identification. Fluorescence analysis can also be used to detect the presence of harmful substances or adulterants by comparing the observed fluorescence spectrum with known standards.

**Table 4: Fluorescence analysis of powder.**

| Treatment | Visible | LongU.V.254nm | Short U.V.365nm |
|---|---|---|---|
| Powder | Grey Brown | Dark green | greenish |
| Powder+Water | Pale yellow | Yellowish-green | Dark brown |
| Powder+5%NaOH | Light yellow | Greenish | Grew |
| Powder+$FeCl_3$ | Brown | Pale yellow | Dark brown |
| Powder+dil. $H_2SO_4$ | Brown | Greenish brown | Dark brown |
| Powder+dil. HCl | cream | Green | Blues Dark |
| Powder+dil. $HNO_3$ | Brownish | Green | Dark brown |
| Powder + Ethanol | cream | yellowish | Dark |
| Powder+KOH | Yellowish | Greenish blue | Dark |

### 3.5 Physicochemical analysis

Physicochemical analysis refers to the evaluation of the physical and chemical properties of a substance to understand its composition, structure, and behavior under different conditions. In the context of plant materials, such as powders derived from herbs or medicinal plants, physicochemical analysis is crucial for determining the quality, purity, and potential therapeutic efficacy of the plant product shown in Table 5.

**Table 5: Physico-chemical analysis of *T.cordifolia.***

| Physico-chemical parameter | Percentage |
|---|---|
| Foreign matter | Nil |
| Percentage extractive | 2.66% |
| A) Ethanol soluble | 3% |
| B) Water soluble Ash value % w/w | 5.33% |
| A) Total ash | 1.16% |
| B) Acid-insoluble ash | 6.34% |
| C) Water-soluble ash Moisture content | 2.03% |

### 3.6 Qualitative Phytochemical screening

Phytochemical screening of ethanolic extract of T. cardifolia leaves shows the presence of several secondary metabolites. Mayer's and Wagner's reagent tests show moderate content for alkaloids, while flavonoid tests have indicated strong positive results. Triterpenes were present in a good extent and tannins, saponins, steroids, and cardiac glycosides were also present in some contents.

**Table no. 6: Qualitative Phytochemical screening of *T. cardifolia*.**

| Phytoconstituents | Extractive | |
|---|---|---|
| | Ethanol extractive | Aqueous extractive |
| Carbohydrates | -ve | +ve |
| Alkaloids | ++ve | -ve |
| Glycosides | +ve | -ve |
| Tannin | +ve | -ve |
| Flavonoid | ++ve | -ve |
| Steroids | -ve | +ve |
| Terpenoids | -ve | +ve |
| Proteins | +ve | -ve |
| Saponin | +ve | +ve |

### 3.7 Thin Layer Chromatography of *T. cardifolia*

Thin Layer Chromatography (TLC) is a widely used analytical technique for separating and identifying the chemical components of a sample. TLC can be employed to profile its phytochemical constituents shown in Table 7.

**Table 7: TLC analysis.**

| Extract | Mobile phase | Evaluation of the chromatogram | | |
|---|---|---|---|---|
| | | Visualization | No. of spots | Rf values |
| | | | | 0.8 |
| Ethanol | Chloroform: methanol: | Iodine saturated | | 0.86 |
| | water | chamber | 3 | 0.88 |
| | (65:25:10) | | | |

## 4. CONCLUSION

*Tinospora cordifolia* is a widely used medicinal plant in traditional systems like Ayurveda, known for its diverse therapeutic potential. It is a perennial climbing shrub with significant pharmacognostics and pharmacological importance. Pharmacognostic evaluation of the stem includes macroscopic features such as a grey-brown, cylindrical stem with a warty surface, and microscopic features like abundant starch grains, lignified fibers, calcium oxalate crystals, and xylem vessels with various thickenings. The leaf is hypostomatic with anomocytic stomata on the lower surface. Ash value studies reveal: Total ash: 5.33%, Acid-insoluble ash: 1.16%, Water-soluble ash: 6.34%. These values confirm the purity and low level of adulterants in the crude drug. Preliminary phytochemical screening shows the presence of important constituents such as alkaloids, glycosides, steroids, flavonoids, diterpenoids, and polysaccharides.

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