



## Pharmacognostic and Physicochemical Analysis of Green Tea

Kalra P, Madan S\*, Agrawal S.S

Amity Institute of Pharmacy, Amity University, Noida, India.

\*Corresponding author's E-mail: smadan3@amity.edu

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### ABSTRACT

Green tea is obtained from the plant *Camellia sinensis* by minimal oxidation process. It is an evergreen tree that attains a height of 10-15m; leaves are light green in colour and are lanceolate & alternate. The main constituent present in green tea is Epigallocatechin-3-gallate. This component is responsible for all the biological activities that it shows like anticancer, antioxidant, antidiabetic, anti obesity, antihypertensive, anti platelet, use in cardiovascular diseases etc. The current research assists for the pharmacognostical standardization of the plant *Camellia sinensis*. The study also includes comparing various phytochemical parameters like ash value, extractive value, loss on drying, as well as preliminary phytochemical tests to detect the different constituents present in the plant. The microscopy of the plant is also carried out to find out the internal structure of the plant.

**Keywords:** Epigallocatechin-3-gallate, Green tea, Pharmacognostical, Physicochemical, Phytochemical.

### INTRODUCTION

Herbs are staging a comeback and herbal 'renaissance' is happening all over the globe. The herbal products today symbolize safety in contrast to the synthetics that are regarded as unsafe to human and environment. Although herbs had been prized for their medicinal, flavoring and aromatic qualities for centuries, the synthetic products of the modern age surpassed their importance, for a while. However, the blind dependence on synthetics is over and people are returning to the naturals with hope of safety and security.<sup>1</sup> Over three-quarters of the world population relies mainly on plants and plant extracts for health care. Plants, especially used in Ayurveda can provide biologically active molecules and lead structures for the development of modified derivatives with enhanced activity and reduced toxicity.

A standardized extract means that the manufacturer has verified the active constituent believed to be present in the herb is present in the preparation and that the potency and the amount of active ingredient is assured in the preparation. Standardization process also ensures batch to batch uniformity, confirmation of correct amount of dosage or extract per dosage unit.

Thus the present study deals with the establishing the standardization profile of *Camellia sinensis* (*C. sinensis*) which would be of great value in botanical identification, authentication of plant and also help in preventing adulteration. The modern era faces a number of growing ailments and diseases that are a serious concern to normal sustenance of an individual scenario. These include cancer, diabetes, hypertension, bacterial and fungal infections, dental caries, skin diseases like acne and many more. Control and cure of these diseases require a source that can overcome these health concerns and that has minimal potential to cause adverse effects.

Catechin present in green tea is the solution for all problems.<sup>2</sup> This situation and need has brought *C. sinensis* into picture which is a potent antioxidant<sup>3</sup> and antihypertensive agent<sup>4</sup> existing in nature. Other studies also reveal that *C. sinensis* also known as green tea is useful in curing various health disorders like cancer<sup>5</sup>, cardiac disorders<sup>6</sup>, obesity<sup>7</sup>, asthma<sup>8</sup>, microbial infections.<sup>9</sup>

### MATERIALS AND METHODS

#### Chemicals

All the chemicals and reagents used were of analytical grade purchased from Sigma Chemical Co. (St Louis, MO, USA), Merck (Darmstadt, Germany) and Qualigens (Mumbai, India).

#### Collection of plant material

Dried leaves of *C. sinensis* were procured from Sood Brother's, Lahori gate, Old Delhi. The identification of the dried leaves of *C. sinensis* were verified by Dr. H.B Singh, Head, Raw Materials Herbarium and Museum, NISCAIR, New Delhi and a voucher specimen number NISCAIR/RHMD/Consult/-2011-12/1916/216 for the leaves were obtained.

#### Experimental

##### Standardization and Physicochemical analysis

The percentage physico-chemical values, viz, total ash, acid insoluble ash, water soluble ash, loss on drying and extractive values after successive extractions in various solvents such as aqueous, methanol and ethanol were determined.<sup>10,11</sup>

##### Extraction of plant material

The leaves were shade-dried at room temperature and powdered. The dried powder (500 gm) was successively extracted using methanol, ethanol and water by using a



Soxhlet apparatus. The last trace of the solvent was removed under reduced pressure distillation and then vacuum dried.

### Preliminary Phytochemical Screening

Preliminary phytochemical tests were carried out for methanolic extract of *C. sinensis* to detect the presence of various classes of phytoconstituents by using standard procedures described by Harborne.<sup>12</sup>

### Microscopy

#### Sectioning

The Paraffin embedded leaves of *C. sinensis* were sectioned with the help of rotary microtome. The thickness of the section was 10 to 12  $\mu\text{m}$ . Dewaxing of the section was done by customary procedure.<sup>13</sup> The sections were stained with aniline blue.<sup>14</sup> The dye rendered yellowish brown colour to the lamina, blue to the

unicellular trichomes, red to thin walled parenchyma cells which contains sclereids, brown colour of xylem which is present in the form of band etc. Wherever necessary sections were also stained with saffranin and fast-green and IKI (for starch).

### Photomicrographs

Microscopic descriptions of tissues were supplemented with micrographs wherever necessary. Photographs of different magnifications were taken with Nikon Labphot 2 microscopic unit. For normal observations bright field was used. For the study of crystals, starch grains and lignified cells, polarized light was employed. Since these structures have birefringent property, under polarized light they appear bright against dark background. Magnifications of the figures are indicated by the scale-bars. Descriptive terms of the anatomical features are as given in the standard anatomy books.<sup>15</sup>

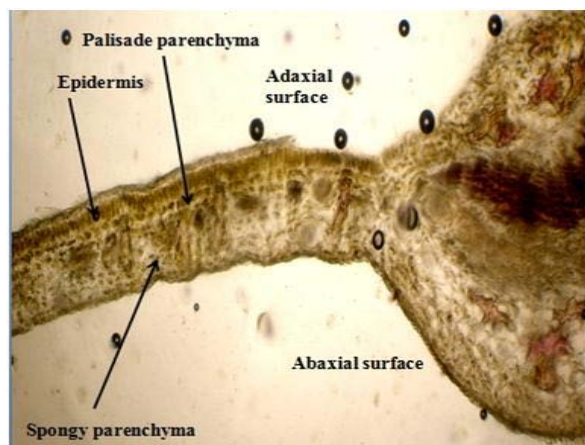


Figure 1a: T.S. of Lamina of *C. sinensis*

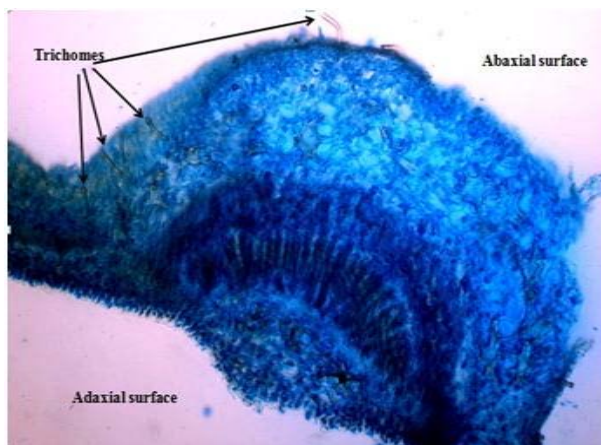


Figure 1b: T.S. of Midrib of *C. sinensis* with aniline blue

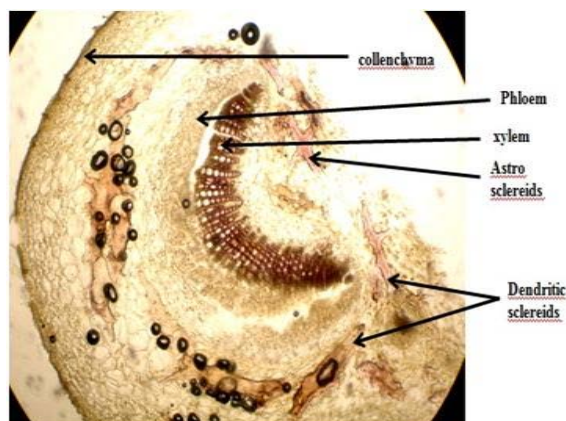


Figure 1c: T.S. of midrib of *C. sinensis* with phloroglucinol and HCl

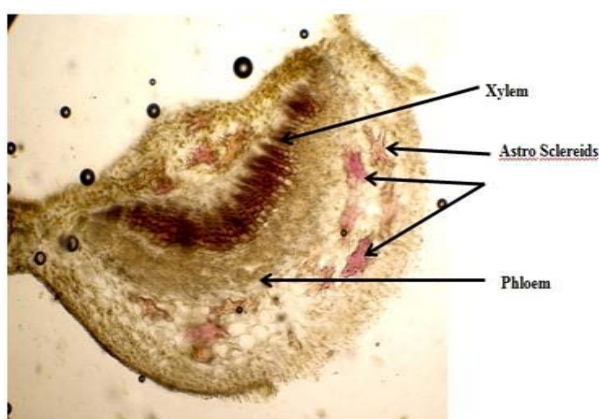


Figure 1d: T.S. of midrib of *C. sinensis*

## RESULTS AND DISCUSSION

### Physicochemical analysis

Physico-chemical parameters i.e. ash value of a drug gives an idea of the earthy matter or the inorganic composition and other impurities present along with the drug. The ash values (Table 1) of the powdered *C. sinensis* leaves revealed a high concentration of total ash i.e. 8.5% w/w. Loss on drying (Table 2) of the powdered *C. sinensis* leaves revealed the presence of 5.50% of moisture in a

drug. Extractive values are primarily useful for the determination of exhausted or adulterated drugs. The results of methanol, ethanol and water soluble extractive values are shown in (Table 3). The methanol extract showed the highest extractive value of 38% w/w. These studies help in authentication of the plant since there is no work reported on their pharmacognostical investigation previously. Preliminary phytochemical screening of the leaves of *C. sinensis* showed the presence of tannins, saponins, cardiac glycosides,

terpenoids, flavanoids and alkaloids. The powder when examined under the microscope exhibits the following inclusions. The Transverse section (T.S) of the leaf of *C. sinensis* depicts the isobilateral nature of the leaf with a single layered well differentiated palisade parenchyma just below the thick epidermis on the adaxial surface of the leaf where as mesophyll consist of loosely arranged spongy parenchyma. The abaxial surface consists of a comparatively thin epidermis as compared to the adaxial surface and devoid of palisade cells (Fig 1a). The leaf surface contains the unicellular trichomes with slightly globular head (Fig 1b). The T.S of the mid rib shows the remnant trichomes on the abaxial surface with a unicellular epidermis. The ground tissue consist of compactly arranged polygonal thin walled parenchyma which contains inter dispersed lignified astrosclereids and dendritic sclereids which stains red on treatment with phloroglucinol and HCl (Fig 1c). The vascular tissue consists of crescent shaped xylem surrounded by phloem. In the xylem the protoxylem is towards the pith and metaxylem pointing towards the phloem which is present outside the xylem in the form of a band (Figure 1c-1d).

**Table 1:** Results of Total ash, Acid insoluble ash and Water soluble ash in *C. sinensis*

Parameter	% w/w
Total ash	8.5
Acid insoluble ash	1.25
Water soluble ash	3.2

**Table 2:** Results of Loss on Drying of *C. sinensis*

Name of Plant	Loss on drying (% w/w)
<i>C. sinensis</i>	5.50%

**Table 3:** Results of Extractive values by Hot Soxhlation

Type of Extract	% w/w of Extractive Value
Methanol	38
Ethanol	28
Water	32

**Table 4:** Results of Phytochemical screening of *C. sinensis*

Phytochemical test	Green tea
Tannins	+
Saponins	+
Cardiac Glycosides	+
Terpenoids	+
Flavanoids,	+
Alkaloids	+

## CONCLUSION

The various specific pharmacognostical characters of *C. sinensis*, can be used as a diagnostic tool for the correct identification of the plant drug and also to detect the authenticity, adulteration of this medicinally useful plant if any.

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