

The Pharmacognostic Study of Leaves of *Caesalpinia crista* (Linn.) and *Leucaena leucocephala* (Lam.)

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Abstract- Medicinal plants *Caesalpinia crista* (Linn.) and *Leucaena leucocephala* (Lam.) belongs to the family Fabaceae. Parts (root, stem, leaves and seeds) of both the plant species have been used in different systems of traditional medication of human ailments. Both species contains various bioactive components which have been used as anti-asthmatic, anti-diabetic, anti-inflammatory, anti-oxidant, anti-bacterial etc. The present paper attempts to evaluate the pharmacognostic characteristics in terms of macro and micro-morphological characters, and quantitative profiles of the leaves of *C. crista* and *L. leucocephala*. Pharmacognostic parameters of the leaves will assist in identification, authentication, and standardization for quality, purity and control adulteration of the crude drug.

Keywords: Macroscopy, Microscopy, Organoleptic Parameters, Quantitative Determination.

I. INTRODUCTION

Medicinal plants play an important role in human health as herbal medicines all over the world. After decades of serious obsession with the modern medicinal system, people have started looking at the ancient healing systems like Ayurveda, Siddha and Unani. This is because of the adverse effects associated with synthetic drugs [1]. According to the WHO, the macroscopical and microscopical description of a medicinal plant is the first step towards establishing the identity and degree of their purity [2]. *Caesalpinia crista* (Linn.) (Synonyms *Caesalpinia bonduc* (L.) Roxb, Syn. *Caesalpinia bonducella* (L.) Fleming [3]) is commonly known as Katakaranja in Hindi and Fever Nut in English. It is a large, scandent prickly shrub which is widely distributed in tropical regions of the world especially in India and Sri Lanka. It is a very valuable medicinal plant because of the presence of various bioactive components utilized in traditional system of medicine [4][5]. The juice of the leaves is antihelminthic; used in elephantiasis, small pox and liver disorders. In Malaya the young leaves are used in intermittent fevers and for expelling intestinal worms. In Ceylon, they are applied for toothache [6]. *Leucaena leucocephala* (Lam.) is a thornless medium sized fast-growing tropical tree and indigenous to Southern Mexico and Northern Central America and now in many tropical and sub-tropical regions it has grown widely. White lead tree, White popinac, Jumbay and wild Tamarind are the common names. Kubabul or subabul is the popular name in India. Due to the outstanding multiple uses it was promoted as a "miracle tree". It has been used to cure various ailments because of its medicinal values and also used to control soil

erosion, fuel wood, timber, fodder, green manure, etc.[7]. It has medicinal properties ranging from control of stomach diseases to contraception and abortion [8][9]. 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 *C. crista* and *L. leucocephala*.

II. MATERIAL AND METHODS

2.1 Collection and Authentication of Botanical Material

Fresh leaves of *C. crista* and *L. leucocephala* were collected from the local area around Ajmer, Rajasthan (India) and authenticated by the taxonomist Dr. C.B. Gena. A herbarium specimen of each has been deposited at the Department of Botany, Samrat Prithviraj Chauhan Government College Ajmer.

2.2 Preparation for Examination

Collected fresh leaves of plants *C. crista* and *L. leucocephala* were cleaned thoroughly to remove adhering foreign bodies and other contaminants. Microscopic evaluation was done by using standard methods.

2.3 Chemicals

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

2.4 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.

2.5 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.

2.6 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 [10] 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); [11]; [12]; [13]

- 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[14][15].

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

III. RESULTS/DISCUSSION

3.1 Macromorphology

The results of the organoleptic and macroscopic examination established that the plant *C. crista* is an extensive climber which branches finely and is grey-brown in color. It is armed with hooked hard yellow prickles. Leaves of plant are pinnately compound with even number of leaflets (paripinnate) and phyllotaxy is opposite/ superposed. The leaflets have dimension (l*b) 14.24 \pm 0.24, terminal leaflets are slightly longer than the lower leaflets, number of leaflets range between 12 -18, each being elliptical/oblong having entire margin with pilose trichomes, the apex is acute/obtuse; the leaflets are dark green on adaxial surface and light green on abaxial surface, glabrous, petiolate (very short); a curved hook is present at the base of each leaflet on abaxial side, the venation is unicostate reticulate.

The results of the organoleptic and macroscopic examination established that the plant *L. leucocephala* is large erect tree. Leaves of the plant are pinnately compound with even number of leaflets (paripinnate) and phyllotaxy is opposite/ superposed. The leaflets have dimension (l*b) 0.86 \pm 0.04, number of leaflets range between 18-24, petiole absent/ sessile, entire margin, , elliptical, apiculate apex, the color being dark green on adaxial surface and light green on abaxial surface, glabrous, stipulate/ interpetiolar, unicostate reticulate venation. Raised glands are present at the base of each leaf.

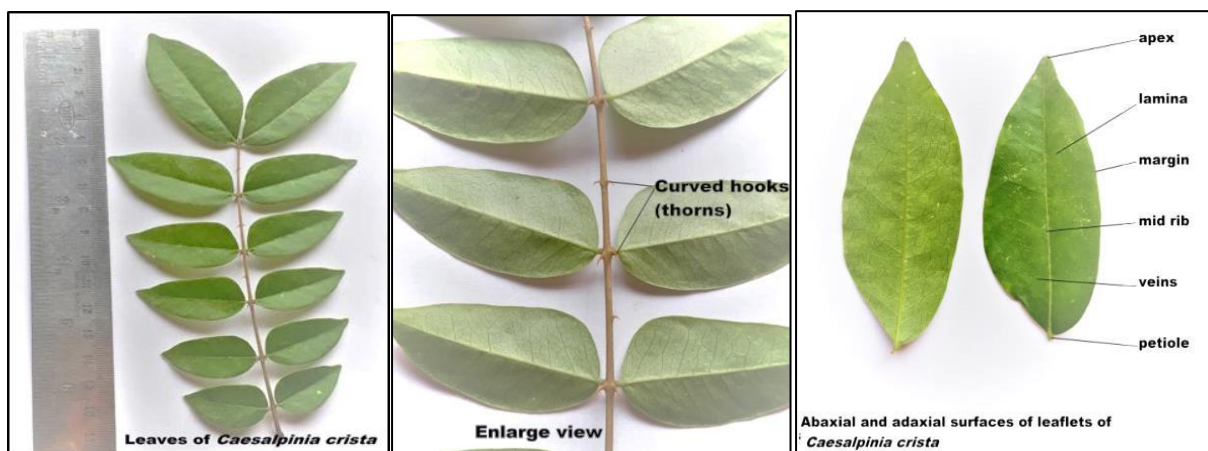


Figure1. Macro-morphology of leaves of *C. crista* (adaxial surface and abaxial surface)



Figure2. Macro-morphology of leaves of *L. leucocephala* (adaxial surface and abaxial surface)

Table1. Organoleptic Parameters

S.N.	Parameters	<i>Caesalpinia crista</i> (Linn.)	<i>Leucaena leucocephala</i> (Lam.)
1.	Leaf type	Pinnately Compound/Paripinnate	Pinnately Compound/Paripinnate
2.	Glands at leaf base	Absent	Present
3.	Phyllotaxy of leaflets	Alternate/Opposite/Superposed	Alternate/Opposite/Superposed
4.	Outgrowths at base of leaf-lets	Curved hooks	Interpetiolar stipules
5.	Colour of leaf-let (adaxial surface)	Dark green	Dark green
6.	Colour of leaf-let (abaxial surface)	Light green	Light green
7.	Petiole (of each leaf-let)	Petiolate	Absent/ sessile
8.	Number of leaflet	12–16	18–24
9.	Composition of lamina (of each leaf-let)		
a.	Shape	Elliptical	Elliptical
b.	Dimension (l*b)	14.24±0.24	0.86±0.04
c.	Margin	Entire with pilose trichomes	Entire
d.	Apex	Acute	Apiculate
e.	Surface appearance	Glabrous	Glabrous
f.	Venation	Unicostate	Unicostate

3.2 Micromorphology

The results of the micromorphology reveal that the leaflets of *C. crista* have apple type stomata (stomata present only on the lower surface). The epidermal peeling of abaxial surface of the leaflet reveals the presence of large, polygonal, thin walled epidermal cells and paracytic stomata which are surrounded by 2 or 3 subsidiary cells on either side of the guard cells and are parallel to stomata. The peeling of adaxial surface of leaf-lets consists of small polygonal thin walled epidermal cells. Trichomes are absent on both surfaces but some pilose unicellular trichomes with glandular base are present on leaf margin.

The results of the micromorphology reveal that the leaf-lets of *L. leucocephala* consist of potato type stomata (more stomata are present on lower surface and less on its upper surface). The epidermal peeling of both the abaxial and adaxial surfaces of leaf-lets, exhibits the presence of large, polygonal, thin walled epidermal cells and paracytic stomata. There were 2 or 3 subsidiary cells on either side of the guard cells and which are parallel to the stomata. Trichomes are absent on both the surfaces.

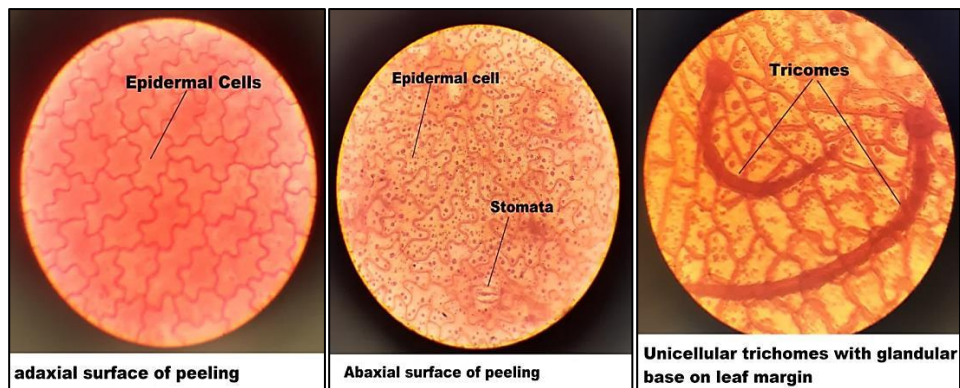


Figure 3: Micromorphology of leaves of *C. crista* (adaxial surface and abaxial surface)

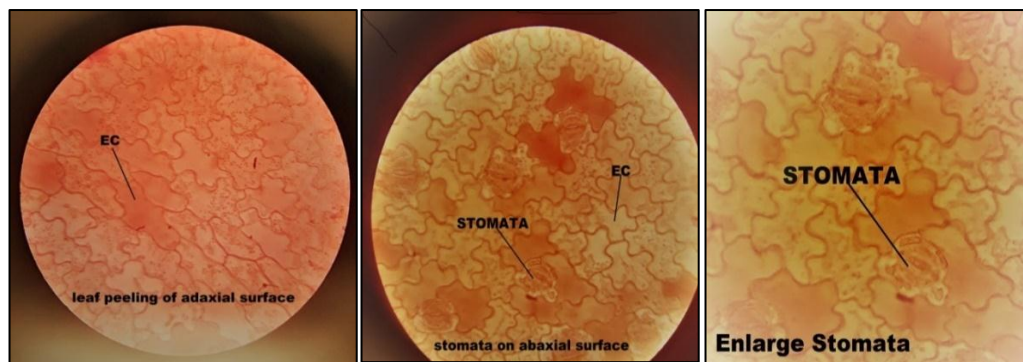


Figure4. Micromorphology of leaves of *L. leucocephala* (adaxial surface and abaxial surface)

3.3 Quantitative microscopy

The quantitative analysis shows that the number of epidermal cells is 52.5 ± 0.63 and 54.7 ± 0.8 , stomata number is 0 and 4.3 ± 0.22 , stomata index is 0 and 7.26 ± 0.33 for adaxial and abaxial surfaces respectively for the leaf-lets of *C. crista*.

The results of quantitative analysis of leaf-lets of *L. leucocephala* reveals that the number of epidermal cells is 45.7 ± 0.31 and 61.6 ± 0.8 , stomata number is 0.3 ± 0.1 and 6.1 ± 0.6 , stomata index is 0.64 ± 0.34 and 8.95 ± 0.9 for adaxial and abaxial surfaces respectively.

Table2. Quantitative Observations

S.N.	Parameters	<i>Caesalpinia crista</i> (Linn.)	<i>Leucaena leucocephala</i> (Lam.)
1.	Stomata number on adaxial surface	0	0.3 ± 0.1
2.	Stomata number on abaxial surface	4.3 ± 0.22	6.1 ± 0.6
3.	Epidermal cell number on adaxial surface	52.5 ± 0.63	45.7 ± 0.31
4.	Epidermal cell number on abaxial surface	54.7 ± 0.8	61.6 ± 0.8
5.	Stomatal index on adaxial surface	0	0.64 ± 0.34
6.	Stomatal index on abaxial surface	7.26 ± 0.33	8.95 ± 0.9

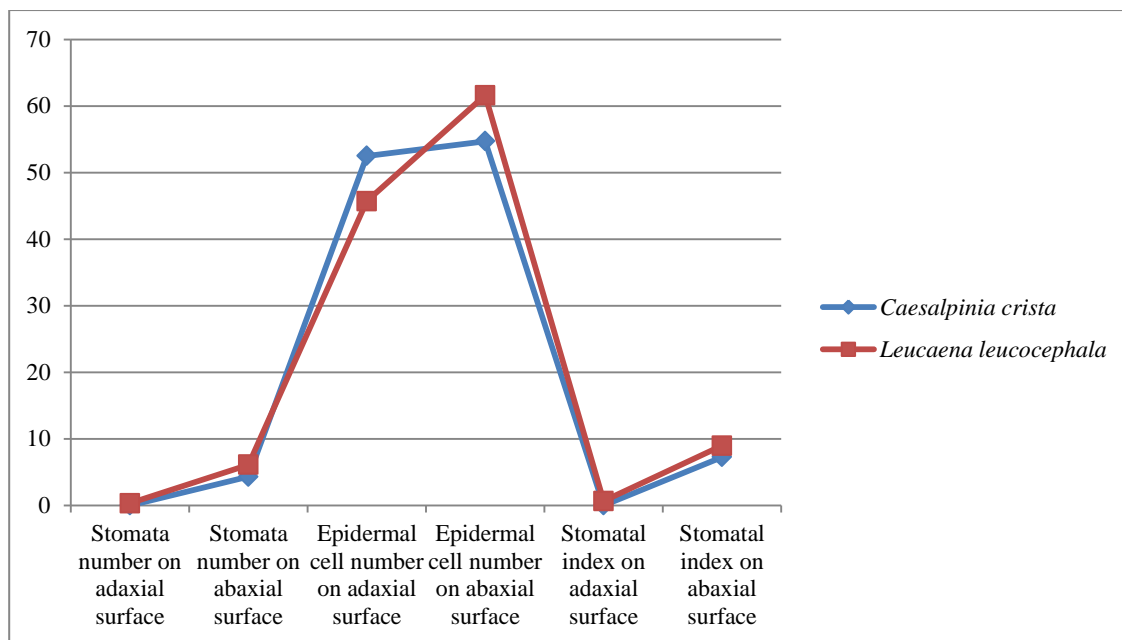


Figure5. Graphical presentation of mean values of Parameters

IV. CONCLUSION

The pharmacognostic parameters in terms of macro and micro-morphological characters of the leaves of *C. crista* and *L. leucocephala* might be useful in identification,

standardization and authentication of crude drug. The various parameter studied during the present investigation will also be helpful in quality assessment and detection of adulterants in the herbal material used by various pharmaceutical companies.

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