

PHARMACOGNOSTIC STUDIES ON THE LEAF OF *CALOTROPIS GIGANTEA* R. BR. EX AIT.

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## ABSTRACT

The macroscopic and microscopic characters of the leaf of *Calotropis gigantea* R. Br. ex Ait. which is used in the indigenous system of medicine are described. Three layers of closely packed palisade cells, multicellular thin walled trichomes and presence of half stomata in the lower epidermis besides the rubiaceous type of stomata, absence of tannin and presence of fats and oils are the chief diagnostic characters.

*Calotropis gigantea* R. Br. ex Ait., a tall shrub of the Asclepiadaceae is an important medicinal plant of our country. Although the crude drug mainly consists of root and root-bark, different parts, like leaves, flowers and inspissated juice are also important from the therapeutic point of view and as such they are commonly used in our indigenous system of medicine. Several authors have studied the medicinal properties and the chemical constituents of the plant parts but no detailed pharmacognostic studies on the different parts of the plant are available except the root which has been pharmacognostically studied by the Central Research Institute, Trivandrum. The pharmacognostic studies on the leaves of *Calotropis gigantea* are presented here.

*Calotropis gigantea* R. Br. ex Ait. syn. *Asclepias gigantea* Willd. (Hindi:—Madar; Sans.—Arka, Mandara; Beng.:—Akanda; Tam.:—Badabadam; Tel.:—Mandaramu, Jilledu) is an erect spreading perennial shrub with milky juice, greyish white bark, leaves elliptic-oblong or obovate-oblong or acute, flowers inodorous, purplish or white covered with cottony wool and fruit a follicle, fleshy green with numerous ovate, flattened comose seeds. The plant occurs commonly in the warm moist tracts of India being especially abundant in Punjab, Himalayas, Bengal, Assam and in the South India up to Ceylon.

**Parts used:** Root, root-bark, leaves, inspissated juice and flowers. The crude drug consists of dried leaves; the tender fresh leaves are often used in our indigenous system of medicine for various ailments.

**Macroscopic characters:** The leaves are thick, 10-20 cm. in length and 3.8-10 cm. in breadth, glaucous green, clothed beneath with fine cottony tomentum, base narrowed, cordate (Fig. 1).

**Microscopic characters:** Trans sections of the leaves collected from different places in the district of 24 Parganas, West Bengal were made to study the nature of the anatomical structure of the leaves. Trans section of the leaf shows an upper epidermis whose cells are more or less elliptical or oval in shape. The outer walls of these cells are cutinised (Fig. 2). The upper epidermal cells measure  $11.4-53.2\mu \times 11.4-26.0\mu$  in T. S. The epidermal cells are followed by three layers of closely packed palisade cells filled with chloroplasts.

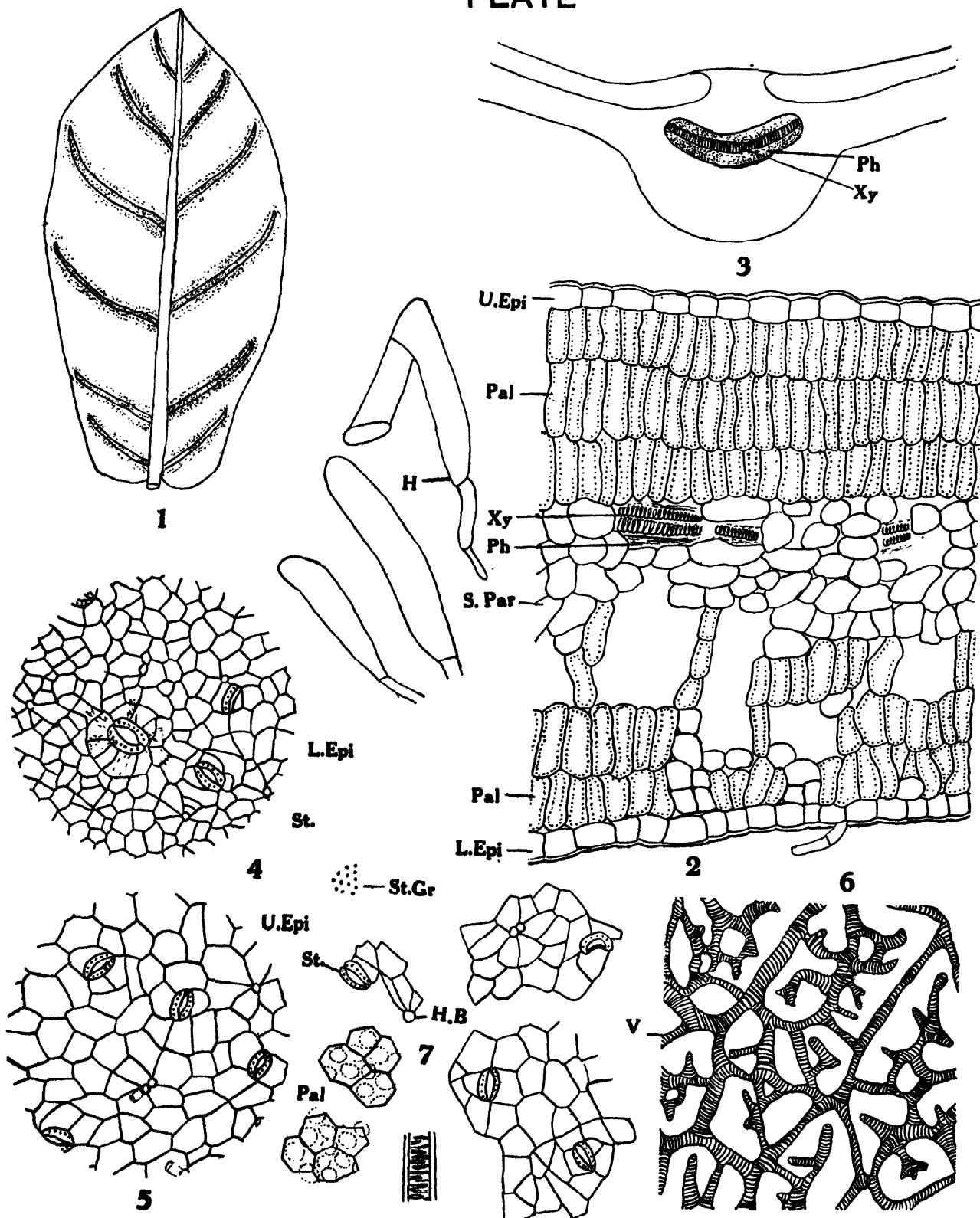
The palisade cells are  $11.4-19.0\mu \times 38.0-114.0\mu$  in T. S. Next to the palisade layers are the amoeboid spongy parenchymatous cells with large intercellular spaces. The cells are thin-walled and measure  $19.0-54.6\mu \times 15.2-40.8\mu$  in T. S. Vascular elements are distributed throughout the upper spongy parenchymatous region. The vessels show annular and spiral thickenings. In the lower part, the parenchymatous cells are replaced by palisade cells in certain places (Fig. 2). The lower epidermal cells are more or less of the same size and shape as the upper epidermal cells but they are a bit smaller. These measure  $15.2-46.5\mu \times 11.4-26.6\mu$  in T.S. Stomata are of the rubiaceous type and in the lower epidermis half stomata are scattered here and there (Fig. 4). Multicellular thin-walled trichomes are found distributed throughout the leaf. The palisade ratio, the vein-islet number (Fig. 6), number of epidermal cells and number of stomata per square millimeter as well as the stomatal index are shown in the Table. Trans section of the petiole exhibits a crescentric, bicollateral bundle besides epidermal cells and thin-walled parenchymatous cells. The epidermal cells contain starch grains. Fats and oils are also present while tannin is absent in the parenchymatous cells as confirmed by micro-chemical tests (Fig. 3).

**Powder:** The leaves when powdered are greyish to yellowish green in colour with a pungent odour and taste. Under the microscope it exhibits small groups of epidermal cells with stomata, portions of vascular elements with spiral vessels, scattered multicellular trichomes and small groups of palisade cells (Fig. 7).

**Chemical constituents:** The leaves contain an active principle Mudarine which is soluble in alcohol and ether but insoluble in cold water and olive oil; it possesses the property of congealing by heat and becoming fluid again on exposure to cold. Besides Mudarine, couitchouc, yellow bitter acid and resin can also be found. The leaves in addition contain three glycosides viz. Calotropin, Uscharin and Calotoxin.

**Uses:** Tincture of the leaves are used in intermittent fevers. Fresh slightly roasted leaves are applied externally to paralysed parts, painful joints and swellings. The leaves are deobstruent; with rock-salt they are roasted in a closed vessel and the ashes are

## PLATE



## EXPLANATION OF FIGURES

*Calotropis gigantea*:

1. Leaf  $\times \frac{1}{4}$ ; 2. T. S. of Leaf  $\times 300$ ; 3. Diagrammatic T. S. of mid-rib  $\times 10$ ; 4. Surface view of lower epidermis  $\times 300$ ; 5. Surface view of upper epidermis  $\times 300$ ; 6. Portion of cleared leaf showing vein-islet  $\times 300$ ; 7. Elements of powdered leaf  $\times 300$ .

H.=hairs; H.B.=hair base; L. epi.=lower epidermis; Pal.=palisade; Ph.=phloem; S. par.=spongy parenchyma; St.=stomata; St. Gr.=starch grains; U. epi.=upper epidermis; V.=veins; Xy.=xylem.

given with whey, by the natives, for cases of enlargement of the liver and spleen, intestinal worms, ascites, anasarca and dysentery. As rubifacient the leaves are smeared with oil, and used with valerians to relieve colicky pain and tympanites. As a poultice they give relief to inflammatory swellings. A powder of dried leaves is dusted on wounds and ulcers to destroy excessive granulation and to promote healthy action; mixed and boiled with sweet oil and turmeric added, it is applied to eczema and other skin eruptions, old sores and ulcers, and to paralysed parts. The drug is also employed to cure all kinds of fits, epilepsy, hysteria,

lock-jaw, convulsions in children, paralytic and venereal complaints.

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TABLE

			No. of epidermal cells per sq. mm. Range	No. of Stomata per sq. mm. Range	Stomatal Index Range
Upper epidermis	...	...	320-544	20-28	3.2-5.5
Lower epidermis	...	...	600-850	28-44	6.0-8.7
			Vein-islet No. per sq. mm.		Palisade ratio
			Range	Mean	Range
Apex	...	...	13-18	13	3.00-4.25
Middle	...	...	10-16	13	2.00-2.75
Base	...	...	12-16	13	1.75-2.75

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