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Pharmacognostic Study

Pharmacognostic evaluation of leaf of *Cordia macleodii* Hook.: An ethnomedicinally important plant

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Abstract

Plants of ethnomedicinal importance have contributed for the development of many new pharmacologically effective molecules/chemical entities to modern medicine. India, the country having one of the richest biodiversity of its flora in its forest, with numerous tribal inhabitants, is able to contribute a lot from ethnomedicine to the ailing humanity. *Cordia macleodii* Hook. (Boraginaceae), an ethnomedicinal plant has been highlighted for its wound healing, aphrodisiac and hepatoprotective activities. It is a medium-sized tree, known as *Panki/ Shikari* by the tribals, rarely found in the forests of Orissa, Chhattisgarh and Madhya Pradesh. So far, the plant has been studied neither for its pharmacognostical characters nor for its pharmacological actions except its hepatoprotective activity. Hence, it has been selected for a detailed investigation which includes pharmacognostic study of its leaf to find out the diagnostic characters and preliminary physicochemical analysis. Results of the study will help in identifying the plant pharmacognostically. Presence of alkaloids, glycosides and tannins were found during the study.

Key words: *Cordia macleodii*, ethnomedicine, pharmacognostical evaluation

Introduction

The plant *Cordia macleodii* Hook. (Boraginaceae), native to India, is a small-sized tree. It is distributed in Deccan and Carnatic region.[1] The plant is used ethnomedicinally for various purposes like healing wounds (leaf, bark), mouth sores (leaf), treating jaundice (bark) and also as an aphrodisiac (seed) by the tribal people of Orissa, Chhattisgarh and Madhya Pradesh.[2] Ethnomedicine is a subfield of ethnobotany or medical anthropology that deals with the study of traditional medicines–not only of those that have relevant written sources, but also especially of those whose knowledge and practices have been orally communicated over the centuries.[3] On searching various journals and books in electronic forms; it was observed that no scientific work has been done as regards its pharmacognostical evaluation.[4] The present study includes macroscopic study of the plant, microscopic study of leaf and preliminary physicochemical investigations of the plant.

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Materials and Methods

Leaves of *C. macleodii* Hook. were used as the material.

Collection of sample

The plant was identified with the help of *Flora of Orissa*.[1] The leaves of the plant were collected by the scholar himself from its natural habitat in the month of November 2008 and voucher specimen has been preserved in the *Dravyaguna* Department of IPGT and RA. The leaves were washed and shade dried. The leaves were pulverized and sieved through 80 mesh and preserved in an air-tight vessel.

Preservation of wet sample

The sample was preserved in a solution prepared from glacial acetic acid, alcohol, formalin and distilled water.[5]

Microscopic and macroscopic evaluation

Thin sections of the petiole and leaf and midrib portion were taken by maceration method[5] and were treated with fluoroglucinol, HCl, and iodine for identification of various contents.[6] Photomicrographs were taken by using Canon digital camera attached to Zeiss microscope.

Phytochemical evaluation

The dried sample was used for the physicochemical and

preliminary phytochemical investigations by the standard procedure adopted by Ayurvedic Pharmacopoeia of India.[7] Fluorescence analysis was done as per the method of Chase and Pratt (1949).[8]

Results and Discussion

Morphology

Habit: Small tree of 9–12 m height, trunk about 50–60 cm in diameter.

Bark: Light green, 12–15 mm thick; reddish color inside, forming exudate on injuring, branchlets white tomentose.

Leaves: Broadly ovate, shiny dark green on the dorsal surface and light green colored on the ventral surface with numerous hairs, 20–25 cm × 15–18 cm, entire, obtuse or bluntly acuminate, somewhat surgose above and with numerous white crystolyths, 3–5 nerved from or from near the base, base often deeply cordate.

Petiole: 3.7-7.5 cm long. Leaf opposed or extra-axillary [Figure 1].

Flowers: Yellowish white in color, polygamous, subsessile, in dense paniculate terminal and axillary tomentose cymes; male flowers with a rudimentary ovary but without style or stigma.

Calyx: 8 mm long, obconic, densely tomentose, ribbed; lobes short, obtuse.

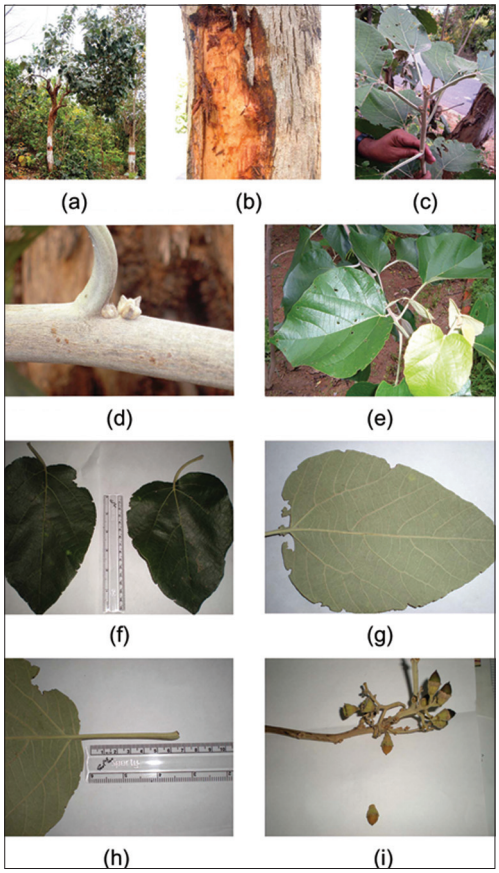

Figure 1: Photographs showing morphology of the plant Cordia macleodii Hook. (a) Whole plant, (b) bark, (c) arrangement of leaves, (d) branchlet, (e) a branch of tree, (f) Individual leaf, (g) individual leaf – ventral side, (h) petiole, (i) Branchlet with fruits

Corolla: Yellowish white in color, 1.6 cm long; lobes 8 by 2.5-3 mm, exceeding the tube, spathulate-oblong, obtuse, veined.[9-10]

Stamens: Usually 6, exerted; filaments hairy at the base.

Anthers: Anthers of male flowers large, those of hermaphrodite flowers smaller.

Drupes: Subglobose, yellowish, somewhat tomentose, apiculate, seated on the broadly campanulate toothed or lobed, ribbed calyx.

Key characters

1. Filaments villous at base
2. Fruiting calyx ribbed

Microscopic study

TS of petiole

TS of petiole is urn shaped in outline. The lower region occupies the major portion of the section and is circular in outline, and the upper portion has a narrowly channeled groove in the middle and is laterally elevated on either side [Figure 2].

Epidermis and trichomes

The TS of the petiole shows an outermost layer of epidermis with plenty of epidermal outgrowths consisting of both glandular and non-glandular trichomes [Figure 2c].

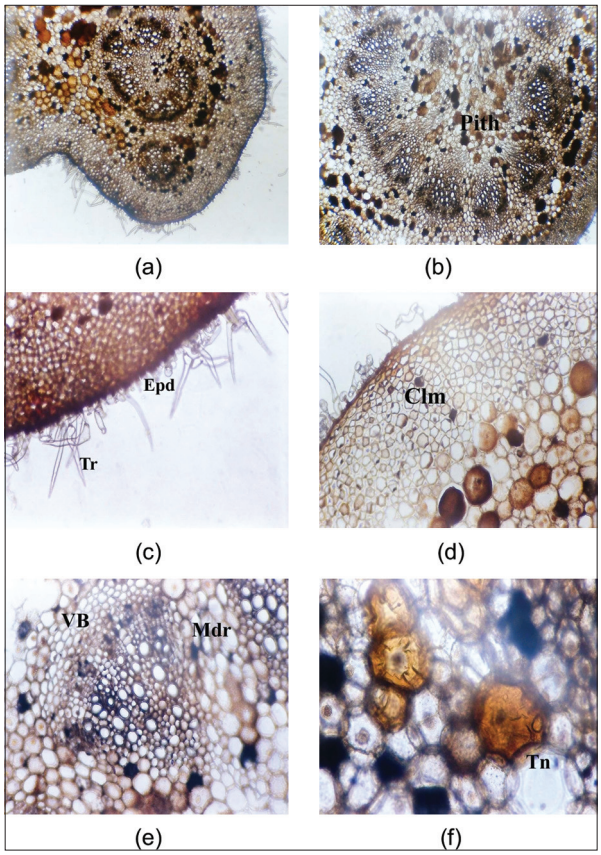

Figure 2: Plate 2 Photographs showing Transverse section of petiole (a) outline of transverse section of petiole (Magnification ×3.5) Epd- Epidermis Tr- Trichomes Clm- Collenchyma Tn- Tannin content Mdr- Medullary rays VB- Vascular bundle. (2) Central portion of lower region showing pith (Magnification ×3.5). (c) Photograph showing epidermis with trichomes (Magnification ×10). (d) Collenchyma (Magnification ×10). (e) A portion of vascular bundle (Magnification ×10). (f) Yellowish brown (tannin) content (Magnification ×20)

Collenchyma
Underneath the epidermis, there is a collenchymatous region interspaced with patches of chlorenchyma [Figure 2d].

Vascular bundle
A large circular vascular bundle similar to that of a stem occupies the entire middle region. Two subsidiary vascular bundles are also found underneath the upper elevations. Patches of phloem can be seen on both outer and inner regions of the xylem and are bicollateral in arrangement, surrounded by a parenchymatous bundle sheath.

Both the upper subsidary vascular bundles are similar in arrangement and also with central pith and are bicollateral, surrounded by parenchymatous bundle sheaths [Figure 2e].

Medullary rays
The main vascular bundle consisting of both xylem and phloem is traversed by radially arranged medullary rays in between the vascular bundles. The center is occupied by pith [Figure 2e].

Parenchyma
Majority of the parenchyma cells are also filled with brownish/dark brownish and reddish brown contents. Prismatic crystals of calcium oxalate are also found mostly embedded with brown contents.

Simple starch grains are also found in some of the parenchyma cells of the bundle sheath.

TS of the leaf through the midrib

T.S. of the leaf through the midrib is dorsiventral in outline.

Epidermis
The upper epidermis of the leaf is single layered. The cells are rectangular in shape with thick cuticle. The epidermal cells of the lower region of the lamina are comparatively smaller in size [Figure 3a, b].

Trichomes
Plenty of epidermal trichomes consisting of both glandular and non-glandular types are found on both upper and lower epidermis. The non-glandular trichomes are unicellular and multicellular uniseriate with a bulbous base. The glandular trichomes are usually with a unicellular bulbous head. Some of the glandular trichomes are very large in size with multicellular heads and they have unicellular stalk [Figure 3d, e].

The lower region of the midrib is circular in outline with a middle vascular bundle, and the upper region of the midrib shows a slight elevation at the middle. The tissues underneath the upper elevation are occupied by patches of collenchyma.

Mesophyll
The mesophyll consists of upper radially elongated narrow palisade cells and lower stellate parenchymatous tissues with air spaces. The mesophyll is almost occupied by stellate parenchymatous tissues [Figure 3d].

Vascular bundle
The vascular bundle of the midrib is slightly semilunar in outline and the phloem patches can be seen on both sides of the xylem and hence is bicollateral. The vascular bundle is surrounded by parenchymatous bundle sheath [Figure 3e, f].

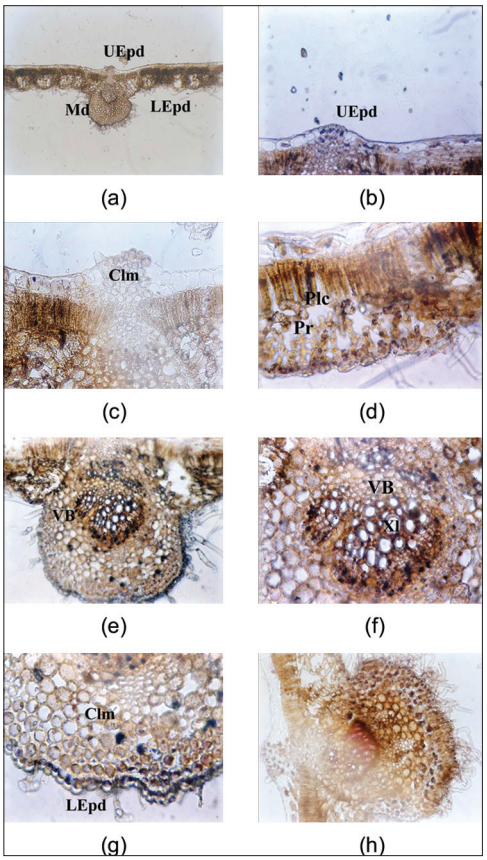

Figure 3:Transverse section of leaf through midrib

Underneath the both epidermis occupies 3–5 layers of collenchyma [Figure 3c, g]. Brownish contents are also found in parenchyma cells of the bundle sheath.

Crystals
Prismatic crystals of calcium oxalate are also present in this region.

Stomata
Epidermal cells of the leaf in surface view are wavy in outline and stomata are found mostly on the lower surface and only a few are seen on the upper surface of the lamina. The stomata are mostly ranunculaceous with a few being cruciferous (anisocytic and anomocytic).

In old leaves, it is very difficult to differentiate stomata because of the presence of covering trichomes. Stomata can be differentiated easily in young leaves.

Physicochemical tests

The tests have been performed as per the guidelines of Ayurvedic Pharmacopoeia of India.[11] The results are shown in Tables 1 and 2.

Test of fluorescence

The result is shown in Table 3.

Table 1: Physicochemical analysis of *C. macleodii* leaf

Parameters	Leaf
Foreign matter	Nil
Loss on drying (% w/w)	4.85
Total ash content (% w/w)	20.66
Acid insoluble ash (% w/w)	3.7
Water soluble extractive value (% w/w)	13.63
Alcohol soluble extractive value (% w/w)	5.36
pH	7.47

Table 2: Qualitative tests of *C. macleodii* leaf

Parameters	Leaf
Alkaloids (M.E.)	+
Glycosides (W.E.)	+
Phenols (M.E.)	+
Flavonoid (M.E.)	+
Terpenoids (Cl.E.)	+
Tannin (W.E.)	+
Saponin (W.E.)	-

M.E. - methanol extract; W.E. - water extract

Table 3: Test of fluorescence of *C. macleodii* leaf

Plant + reagent ↓	Light		
	254 nm	366 nm	Visible
1 g Leaf powder + 1 N HCl	Golden yellow	Parrot green	Light brown
1 g Leaf powder + NaOH + methanol	Dark purple (violet)	Lemon yellow	Green

Conclusion

On the basis of the key characters such as villous base of filaments, ribbed fruiting calyx and pharmacognostical characters, leaf of *C. macleodii* Hook. can be identified, and its identity, purity and strength can be assessed.

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हिन्दी सारांश

जनजातीय औषधि की दृष्टि से महत्वपूर्ण वनस्पति 'कोर्डिया मेक्लिओडी हूक' का द्रव्यपरिचयात्मक परीक्षण

भार्गव भिडे, ए. पी. जी. पिल्लै, वी. जे. शुक्ला, आर. एन. आचार्य

जनजातीय–औषधि(एथनोमेडिसिनल) वनस्पतियों ने आधुनिक चिकित्सा विज्ञान में औषधीय दृष्टि से कार्यकारी नये रेणुओं के अंतर्भाव में बहुत महत्वपूर्ण योगदान दिया है। भारत, जो कि विश्व की सबसे अधिक वनस्पतियों की जैवविविधता वाले देशों में से एक है, जिसमें अनेक जनजातियाँ निवास करती हैं, वह व्याधिग्रस्त मानवजाति को जनजातीय–औषधियों के द्वारा उपकृत करने की क्षमता रखता है। कॉर्डिया मेक्लिओडी हूक (वंश–बोरेजिनसी) वनस्पति जनजातीय– औषधि के परिप्रेक्ष्य में व्रणरोपण, वृष्य तथा यकृत की रक्षा करनें की दृष्टिसे अधोरेखित की गई है। इसका मध्यम आकार का वृक्ष होता है जिसे उड़ीसा, छत्तीसगढ तथा मध्यप्रदेश के जंगलों में अल्प प्रमाण में पाया जाता है तथा जनजातियाँ इसे 'फनकी/सिकारी' नामों से जानती हैं। अब तक यह वनस्पति उसके द्रव्यपरि चयात्मक(फार्माकोग्नोस्टिकल) विशेषताओं के लिये तथा यकृतसंरक्षक कर्म के अतिरिक्त अन्य औषधिय कर्मों के लिये परीक्षित नहीं की गयी है। अतः इसे विस्तृत रूप से अभ्यास करने के लिये चुना गया। इस अभ्यास में इसके प्रयोज्य अंग, अर्थात पत्र का द्रव्यपरि चयात्मक (फार्माकोग्नोस्टिक) परीक्षण जिसमें पत्र के विशेष अंगों का परीक्षण तथा भौतिक–रासायनिक परीक्षण किया गया। इस कार्य के परिणाम वनस्पति को फार्माकोग्नोसी की दृष्टिसे सहायक करने में तथा अल्केलाईड, ग्लाइकोसाईड और टेनिन की उपस्थिति निश्चित कराने में सहायक हैं।