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.

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[6] and were treated with fluorogluconol, 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
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 surges above and with numerous white crysolyths, 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 panículate 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.

Corolla: Yellowish white in color, 1.6 cm long; lobes 8 by 2.5–3 mm, exceeding the tube, spatulate-oblong, obtuse, veined.
Stamens: Usually 6, exerted; filaments hairy at the base.
Anthers: Anthers of male flowers large, those of hermaphrodite flowers smaller.
Drupe: 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].

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

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**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 subsidiary 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].

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.
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.

References

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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.)   | +          |
| Flavanoids (M.E.) | +         |
| Terpenoids (C.I.E.) | +       |
| Tannin (W.E.)    | +          |
| Saponin (W.E.)   | -          |

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

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

हिन्दी सारांश

जनजातीय औषधि की दृष्टि से महत्वपूर्ण वर्गपति ‘कॉर्डिया मेक्लिओडी हूक’ का द्रव्यपरिचयात्मक परीक्षण

भारतीय औषधि (एथनोमेडिसिनल) वनस्पतियों ने आयुर्विज्ञान में औषधि दृष्टि से कार्यक्षम नये रूपों के अंतर्गत में बहुत महत्वपूर्ण योगदान दिया है। भारत, जो विश्व की सबसे अधिक वनस्पतियों के जैवविविधता वाले देशों में से एक है, जिसमें अनेक जनजातियों निवास करती हैं, वह व्यावहारिक मानवविविधता को जनजातीय-औषधि के द्वारा संरक्षित करने की स्थिति रखता है। कॉर्डिया मेक्लिओडी हूक (वंश–वोरेजिनसी) वनस्पति जनजातीय-औषधि के परिचय में ब्रांचिक प्रभाव, वृक्ष तथा युक्त की रक्षा करने की दृष्टि से अध्योपक्रम की गई है। इसका महत्व आकार का वृक्ष होता है जिसे उद्धीण, च्छलिसंघ तथा मध्यप्रदेश के जंगलों में अल्प प्रमाण में पाया जाता है तथा जनजातियों इसे ‘फनकी/सिकारी’ नामों से जानते हैं। अब तक यह वर्गपति उसके द्रव्यपरिचयात्मक व्यापक (फार्माकोग्राफिक) विशेषाधिकारों के लिए तथा युक्त निवास-युक्त कर्म के अंतिम अयोध्य रूपों के लिये परीक्षित नहीं की गई है। अतः इसे वितरित रूप से आयुर्विज्ञान करने के लिए चुना गया। इस अयोध्य में इसके प्रयोज्य अंग, अयोध्य पत्र का द्रव्यपरिचयात्मक (फार्माकोग्राफिक) परीक्षण जिसमें घर के विशेष अंगों का परीक्षण तथा प्रभावकार–रासायनिक परीक्षण किया गया। इस कार्य के परिणाम वर्गपति को फार्माकोग्राफिकी की दृष्टि से सहायक करने में तथा अल्केलाईड, त्लाइकोसाइड और टेनिन की उपस्थिति निषिद्ध करने में सहायक है।