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Pharmacognostic evaluation of Nyctanthes arbortristis bark

Sunil Ashokrao Nirmal [1], Subodh Chandra Pal [2] and Subhash Chandra Mandal [3*]

[1]*Department of Pharmacognosy, Pravara Rural College of Pharmacy, Pravaranagar, M.S., India.*
[2]*Department of Pharmacognosy, NDMVP's College of Pharmacy, Nasik, M.S., India.*
[3]*Pharmacognosy and Phytotherapy Research Laboratory, Department of Pharmaceutical Technology, Jadavpur University, Kolkata, India.*

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ABSTRACT

Objective: To study detailed Pharmacognosy of the bark of *Nyctanthes arbortristis* Linn (Oleaceae), an important plant in Indian system of medicine. **Methods:** the macroscopy, microscopy, physicochemical analysis, preliminary phytochemical testing of powder of the plant bark and other WHO recommended methods for the standardization was done. **Results:** Trunk bark consists of two distinct regions i.e. outer bark and inner bark. Outer bark consists of broad periderm of a wide phellem and inner phelloderm regions. Inner bark is broader than the outer part and it includes all the secondary phloem tissues. It can be distinguished into 2 zones viz. collapsed secondary phloem and non-collapsed secondary phloem regions. Collapsed secondary phloem region consist of thick blocks of phloem sclereids and radially oblique dark streaks of crushed sieve tubes and dilated axial parenchyma cells. Non-collapsed secondary phloem region is the conducting part of the phloem where the sieve elements are intact. It consists of intact sieve tube members, companion cells, axial parenchyma cells and narrow undilated ray. Calcium oxalate crystals are abundant in collapsed phloem region. **Conclusions:** it can be concluded that the pharmacognostic profile of *N. arbortristis* bark is helpful in developing standards for quality, purity and sample identification.

1. Introduction

Nyctanthes arbortristis Linn (Oleaceae) is one of the well known medicinal plant. It is commonly called as nyctanthes means night flowering and arbortristis means as it loses its brightness during day time. It is common wild hardy large shrub or small tree, native to India, distributed wild in sub-Himalayan regions and southwards to Godavari. It is also planted in Indian gardens for ornamental purpose due to its highly fragrant flowers [1-2]. It is a shrub or small tree up to 10 m in height with gray to greenish rough bark with stiff whitish hairs. Leaves are opposite, ovate, acute or acuminate, entire or with few large distant teeth, short bulbous hairs rounded or slight cuneate. Flowers are small, delightful fragrant, sessile, slender, and hairy; corolla glabrous, orange colored and lobes are white. Fruits are a capsules of 1-2 m in diameter, long and broad, compressed, 2 celled separating into 2 flat one seeded carpels, reticular veined and glabrous. Leaves are responsible for some CNS activities like hypnotic, tranquilizing and local anesthetics [3-5] and antiasthmatic activity [6]. β -Sitosterol isolated from *N. arbortristis* leaves showed analgesic and anti-inflammatory activity [7]. Iridoid glucosides isolated from this plant has antileishmanial activity [8]. Ethanolic flower extract of this plant is used for the synthesis of gold nanoparticles [9]. Seeds, leaves and flower extract of this plant showed CNS depressant activity [10]. Arbortristoside-A isolated from seeds possesses anti-inflammatory and analgesic activity [11]. Leaf and fruit extracts are useful in the treatment of arthritis [12]. Arbortristoside A and arbortristoside C isolated from plant

*Corresponding author: Dr. Subhash Chandra Mandal, Pharmacognosy and Phytotherapy Research Laboratory, Department of Pharmaceutical Technology, Jadavpur University, Kolkata-700032, India.
Tel no.: +91 9433098372
Fax no.: +91 33 2837 1078
Email: subhashmandal@yahoo.co.in

showed antiviral activity [13]. For the standardization and quality assurance purpose, the following three attributes must be verified: authenticity, purity and assay. Hence the objective of present study is to evaluate various pharmacognostic parameters such as macroscopy, microscopy, physicochemical and phytochemical studies of the plant.

2. Materials and methods

2.1. Chemicals and instruments

Phloroglucinol, glycerin, hydrochloric acid, potassium hydroxide and all other chemicals used in the study were of analytical grade. Microtome is used for taking sections.

2.2. Plant material

Bark of *N. arbortristis* was collected from Ahmednagar district of Maharashtra in August 2007 and authenticated by Dr. P.S.N. Rao, Botanical Survey of India, Pune, where a sample specimen (voucher number: Nirmal-1) has been deposited.

2.3. Macroscopic and microscopic analysis

The macroscopy and microscopy of the bark of *N. arbortristis* was studied according to the method of Brain and Turner (1975) [14]. For the microscopical studies, transverse sections were prepared and stained. The powder microscopy was performed according to the methods of Kokate (1994) [15] and Khandelwal (2007) [16].

2.4. Physiochemical analysis

Physiochemical values such as the percentage of ash values and extractive values were determined according to the official methods [17-18] and as per WHO guidelines on quality control methods for medicinal plant materials [19-20].

2.5. Preliminary phytochemical screening

Preliminary phytochemical screening was carried out using the standard procedure described by Kokate (1994) [15].

3. Results

3.1. Macroscopic characteristics

Trunk bark is dark gray or brown in color, rough and firm. Bark surface is dippled due to scaling off of circular barks and patchy due to gray brown colored regions. Scaling off of the bark by circular flakes. Inner bark is creamy white, soft and collapsed and non-collapsed phloem zone distinctly visible (Figure 1-1).

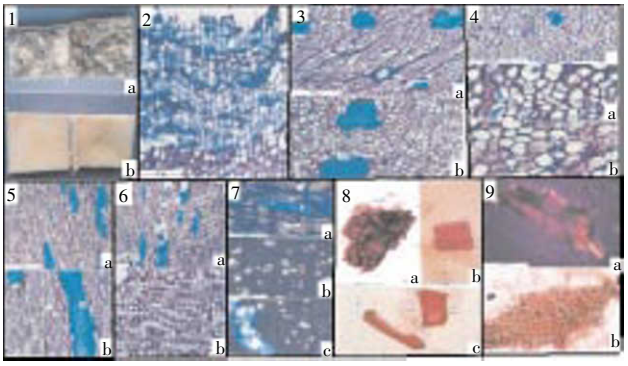

Figure 1. Morphology, histology and powder characteristics of *N. arbortristis* bark.

1-Macroscopic characteristics; a-outer surface; b- inner surface, 2-Structure of the outer bark (periderm), 3- Structure of the inner bark (Collapsed phloem), 4- Structure of the non-collapsed phloem; a- TS of non-collapsed phloem; b- Non-collapsed phloem showing sieve tube members; c- Structure of the perforation plate, 5- TLS of phloem (Collapsed phloem); a- TLS of phloem under low magnification; b- TLS of phloem under high magnification, 6- RLS of phloem; a- RLS of phloem showing sclereids and phloem rays; b-phloem rays enlarged; 7- Crystal distribution in the bark; a-Crystals and sclereids in the heterocellular periderm; b-Crystals in the collapsed phloem; c-Crystals in the phloem ray and sclereids, 8-Powder microscopy in the bark; a-Macrosclereids; b-Square shaped sclereids; c-Rectangular shaped sclereids, 9- Powder microscopy in the bark; a-Sclereids under polarized light microscope; b-Pieces of periderm cell.

Where, Pld- Phelloderm, Pm-Phellem, Pe-Periderm, Scl- Sclereids, CPh- Collapsed phloem, PhP- Phloem parenchyma, PhR- Phloem ray, NCPh- Non-collapsed phloem, ST- Sieve tube members, Pi- Pits, PP- Perforation plate, Cr-Crystal, MScl- Macrosclereid, SScl- Square shaped sclereids, RScl- Rectangular shaped sclereids, W-Wall.

3.2. Microscopic characteristics

Trunk bark consists of two distinct regions i.e. outer bark and inner bark.

Outer bark: Outer bark measures about 600 μm in width. It consists of broad periderm of a wide phellem and inner phelloderm regions. Phellem measures an average radial width of about 500 μm and the phelloderm is 100 μm wide. The outer surface of phellem is uneven with numerous fissures and consists of thin walled, suberised, tangentially oblong