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PHARMACOGNOSTICAL STUDIES ON THE ROOT OF SAHACHARA NILGIRIANTHUS HEYNEANUS (Nees) Bremek – (ACANTHACEAE)

T. R. SHANTHA, J. K. PATTANSHETTY & K. GOPAKUMAR

Regional Research Centre (Ay). Jayanagar, Bangalore – 11, India.

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ABSTRACT: *Nilgirianthus heyneanus is widely used in South India in place of Sahachara (Barleria prionitis L) and is considered as an important Vatahara drug. Detailed pharmacognosy of the root of N. heyneanus commonly known as Karim Kurinji (Malayalam) in Kerala has been carried out. Some of the diagnostic features of the drug are pigmented cystoliths in the cortex and pith region; yellow colour cell contents in the cortex region; thick walled and oval-elongated stone cells in the cortex region.*

INTRODUCTION

Sahachara is one of the most important ayurvedic drug useful in all *vata vikaras.* The roots of the plant *Barleria prionitis* (Acanthaceae) is the accepted source of *Sahachara* (Anonymous 1978) and is commonly used in North India. Studies revealed that the roots of *N. heyneanus* is sold and used by the physicians as *Sahachara* (K. Vasudevan Nair et al 1985) in South India. Some of the important Ayurvedic preparations in which this drug is used as one of the ingredients are *Sahacharadi quadha, Sahacharadi taila, Prashanjana vimardana taila* and *Nilikadya taila* (Anonymous 1978). *Sahachara* is *Kapha vataghna* and is useful in *vata vyadhi* (Rheumatic complaints), *Katisula* (Lumbago), *Vata kantaka* (Sprain of the ankle), *Kampa vata* (tremors), *Unmada* (Insanity) and *Andra-vriddhi* (Hernia).

The literature review revealed that no pharmacognostical work on *N. heyneanus* is carried out. Hence, an attempt has been initiated here.

MATERIALS AND METHODS

Fresh samples of the roots of *N. heyneanus* were collected from Konny (Kerala) forest division. They were fixed in 70% alcohol according to Wallis (1967) and microchemical studies were performed according to Johansen (1940). For chromatographic and fluorescence studies, drug was sieved through 60 mesh and analysed following Block et al, (1968) and Chase and Pratt (1949) respectively. Physical constants have been determined as per *Indian pharmacopoeia* (Anonymous 1966).

Botanical Description

Small shrubs with hirsute stems on the upper part; leaves broadly elliptic, acuminate at both ends, hairy; spikes subglobose, bracts pink, orbicular, glabrous; calyx lobes linear oblong, corolla purple, lobes acute; stamens 4, filaments pilose below; ovary glabrous; style slightly pubesecent. Capsules oblong, sub-acute, 4 seeded, seeds ovoid, flattened and glabrous. (Fig.A).

Macroscopical Characters

The roots are 36 to 28 cms, long, curved and tapering towards the ends, varying in thickness from 5 to 10 mm across. Outer surface is rough, light brown to dark brown in colour, peels off easily in mature roots, rootlets many, slender and it has no characteristic smell, fracture is brittle and rough. (Fig. B).

Microscopical Characters

The roots are nearly circular in transverse section and regular in outline with a prominent stellar portion interspersed by radiating medullary rays with small pith. (Fig. 1). The outer most layer is the cork, made up of 7 to 10 layered thin walled, brown, suberised rectangular parenchymatous cells. The cork cambium is single layered, thin walled and rectangular. The cortex is 10 to 15 layered and consists of thin walled tangentially elongated to isodiameteric yellow coloured parenchymatous cells with little intercellular spaces. Some of these cells contains oil globules, yellow cell contents of tanniferous nature and pigmented cystoliths. In between the parenchymatous cells, few thick walled cells are also present and few stone cells are scattered, thick walled, varying in size and shape, some are elongated and others are oval with narrow lumen (Fig. 2). Followed by cortex is a broad vascular cylinder, the phloem is very narrow zone consisting of very small thin walled, polygonal cells. Sieve tubes and companion cells are not distinct but phloem fibres are well developed and found scattered is small groups of 2 or 3 (Fig.3). Followed by this Cambium present. Next to cambium is the xylem region where xylem vessels are present interspersed by uni to biseriate medullary rays, (Fig. 3) with a small pith. Pith is made up of thin walled, rounded, parenchymatous cells with little intercellular spaces. Some of the cells contain pigmented cystoliths and oil globules (Fig. 3).

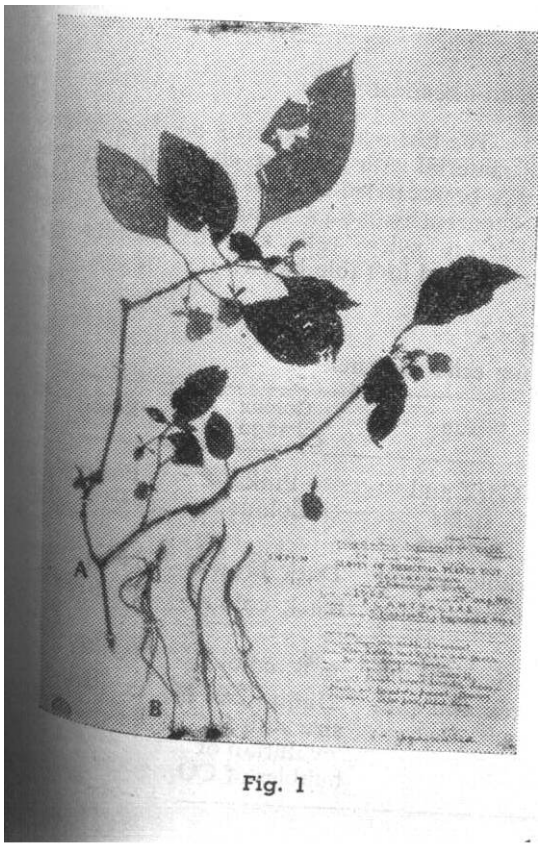

Fig. 1

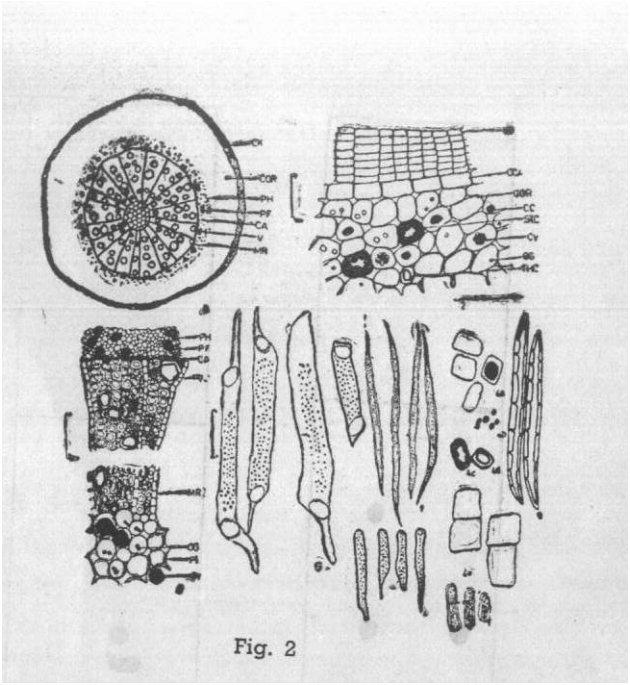

Fig. 2

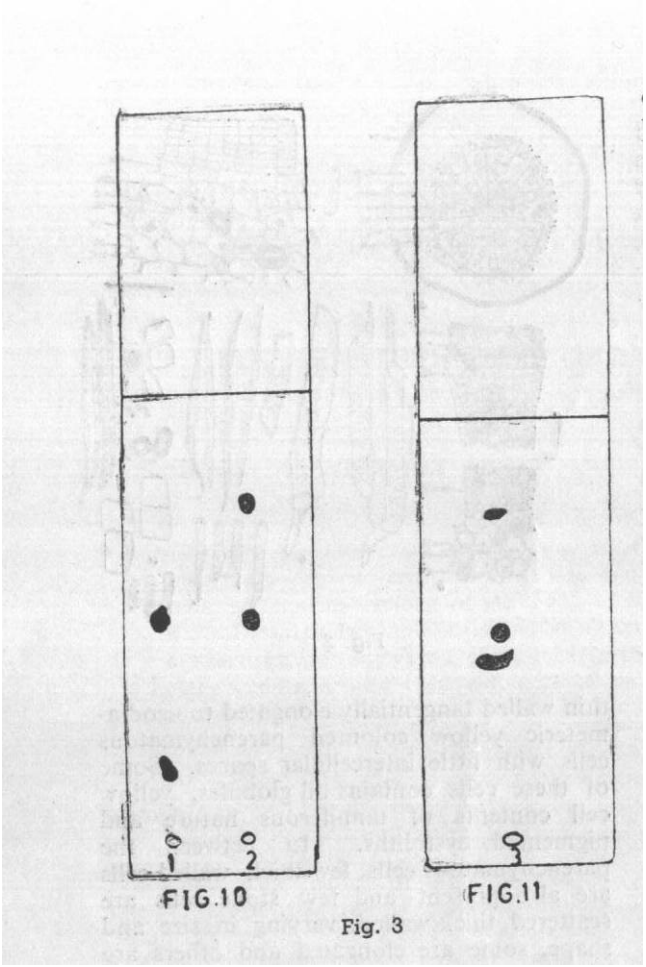

Fig. 3

Macerate of the root shows parenchymatous cells with yellow cell contents (Fig.4a) oil globules (Fig. 4b), thick walled oval stone cells with narrow lumen (Fig. 4c) thick walled cells (Fig. 4d), broad rectangular medullary ray cells (Fig.4e). Xylem consists of vessels (Fig. 5) which varies in size and shape and posses transverse oblique perforations and simple pits on their walls, some are short and wide, while others are narrow and elongated. Most of the vessels have tail like ends beyond their oblique end walls. Tracheids are narrower with simple pits and tapering ends and pits on their walls (Fig. 6). Xylem fibres are many, thick walled with pointed ends and pits (Fig. 7). Xylem parenchyma cells are shorter in length, thick walled with simple pits (Fig. 8) phloem fibres are spindle shaped, thick walled, strongly lignified. (Fig. 9).

In case of young roots, instead of cork and cork cambium, single layer of epidermis present and number of layers of cortex and phloem are less, when compared to mature roots.

Histo-Chemical Tests

The histo-chemical tests on the sections of material with different chemical reagents have been carried out to detect the action on parenchymatous tissues, their contents and on xylem cells and the results are mentioned in Table No. 1.

TABLE – 1
Histo-chemical tests for cell contents

Sl. No.	Reagents (Chemicals)	Tests for	Tissue	Colour change	Result
1	Phloroglucinol + Conc. HCl + alcohol	Lignin	Cork and stellar portion	Pink Colour	Positive
2	Iodine solution	Starch	Whole section	Dark brown	Negative
3	Aqueous ferric chloride solution	Tannins	Cortex	Black colour	Positive
4	Sudan III Solution	Oil	Cortex and pith	Pink colour	Positive
5	Conc. Hydrochloric acid	Cystoliths (Calcium carbonate crystals)	Cortex and pith	Diminishes in size with the evolution of bubbles of CO_2	Positive

POWDER ANALYSIS

Powder is light brow and when treated with different concentrated solutions like Hydrochloric acid, it turns light brown colour with concentrated Nitric acid, brown colour with Sulphuric acid, black colour with Sodium hydroxide and Glacial acetic acid no change in colour.

Measurements of different cells are provided in Table No. 2.

Phyto-Chemical Studies

The Phyto-chemical studies have been carried out as per methods mentioned in *Indian pharmacopoeia* (Anonymous 1966).

Organic Analysis

Organic constituents (qualitative) done by standard methods are provided in Table.4.

TABLE – II
Measurements of different cells and tissues (μ) in microns

1	Cork (T)	30 – 35 – 40 x 20 – 30 – 35
2	Cork cambium (T)	40 – 50 – 60.5 x 45 – 60 – 60.8
3	Cortex (T)	40 – 55 – 60
4	Phloem (T)	15 – 20 – 25 x 10 – 15 – 20
5	Phloem fibre (T)	15 - 20 – 30
6	Vessel (T)	30 – 45 – 50
7	Medullary Ray (T)	15 – 20 – 25 x 10 – 15
8	Pith (T)	35 – 40 – 50 x 25 – 30 – 35
9	Thick walled Cell (T)	40 – 60 – 75
10	Stone cells (T)	45 – 50 – 60
11	Vessel (M)	125 – 410 – 600 x 20 – 40 – 55
12	Tracheids (M)	85 – 155 – 300 x 10 – 20 – 25
13	Fibres (M)	250 – 450 – 1250 x 20 – 25
14	Xylem parenchyma (M)	32 – 60 – 200 x 15 – 20 - 25
15	Stone cells (M)	45 – 50 – 60 x 15 – 20 – 25
16	Thick walled cell (M)	40 – 60 – 75
17	Oil globules (M)	50 – 60 – 90
18	Parenchyma cell (M)	40 – 50 – 65
19	Medullary Ray Cell (M)	60 – 75 – 85 x 20 – 25
20	Phloem fibres (M)	230 – 420 – 900 x 25 – 30 - 35

T = Measurements in t.s. M = Measurements of macerate

TABLE III
Physical constants (Proximate analysis)

% loss on drying at 110oC	8.40
% total ash	3.82
% water in soluble ash	0.88
% acid in-soluble ash	0.20
% crude fibre	15.26
% Extractive principles	
Petroleum ether	2.30
Benzene	0.80
Chloroform	0.20
Ethanol	6.52
Water	4.45
% Solubility	
Ethanol	2.80
Water	3.85

TABLE –IV
Organic constituents

Constituents	Result
Steroid	++
Triterpenoid	--
Flavanoid	--
Phenol	--
Tannins	++
Saponins	++
Sugars	++
Glycoside	--
Alkaloids	+

Fluorescence Analysis

The powdered drug was observed under the long (365 mμ) and short (254 mμ) wave length of UV light and results are provided in table 5.

Chromatography

Thin layer chromatographic studies were carried out for petroleum ether, chloroform and alcohol extracts of the drugs and the chromatrographic patterns are provided in the figures 10 and 11. The Rf. Values of the different extracts are recorded in table 6.

TABLE – V
Fluorescence analysis

Treatment	Visible	Ultra violet rays	
		Short wave 254 mμ	Long wave 365 mμ
Powder as such	Greenish	White	White
Powder in methanol	Dark green	Ash colour	Ash colour
Powder in 1 N. NaOH (Methanolic)	Yellowish green	No fluorescence	No fluorescence
Powder in 1 N. HCl	Yellowish green	Straw grey	Straw grey
Powder in Ethanol	Yellowish green	Dark ash	Light ash

TABLE – VI
Rf. Values of thin layer chromatography

S. No.	Extract	Solvent system	Developer	Rf. value
1	Petroleum ether (60 – 80^{o})	Chloroform Benzene (7:3)	Conc. H_2SO_4	0.15 ; 0.51
2	Chloroform	- do-	- do –	0.51 ; 0.75
3	Alcohol	Propanol : Pyridine : Water : Acetic Acid (8 : 8 : 4 : 1)	Ammonical silver nitrate	0.42; 0.49; 0.78

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Explanation of Figures

Fig. A … Herbarium specimen (*N. heyneanus)*

Fig. B … Roots

Fig.1 … T.S. of the Root (Semidiagrammatic)

Fig.2 … Cork, Cork Cambium and Cortex portion enlarged

Fig. 3 … Stelar and pith portion enlarged.

Figure 4a to Figure 9: Macerate

Fig. 4a … Parenchymatous cells

Fig. 4b … Oil globules

Fig. 4c … Stone cells

Fig. 4d … Thick walled cell

Fig. 4e … Medullary ray cell

Fig. 5 … Vessels

Fig. 6 … Tracheids

Fig. 7 … Xylem Fibres

Fig. 8 … Xylem parenchyma

Fig. 9 … Phloem fibres

Fig. 10 & 11 Chromatograms (TLC)

Abbreviations

CCA – Cork Cambium; CC – Cell Content; CK – Cork;

COR – Cortex; CY – Cystoliths; MR – Medullary Ray;

OG – Oil globule; PF – Phloem fibre; PH – Phloem;

PI – Pith; STC – Stone cell; THC – Thick walled cell

V- Vessel

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