World Journal of Pharmaceutical Science & Technology

Journal homepage: www.wjpst.com

Original Research Article

PHYTO-PHARMACOGNOSTICAL INVESTIGATION ON STEM OF *CESTRUM NOCTURUM* L. - AN EXTRA PHARMACOPOEIAL PLANT

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Received: 11-11-2017, Revised: 15-01-2018,Accepted: 01-03-2018

ABSTRACT

The family, Solanaceae, also known as Potato or Nightshade family bears some ornamental plants like *Cestrum diurnum, Nicotina alata, Hyoscymus niger, Cestrum nocturnum, Petunia hybrid* etc having economic importance. *C. nocturnum* L. is one such plant, which is an extra pharmacopoeial drug, cultivated as ornamental plants throughout India. *C. nocturnum* having folklore claims like fruits are used as anti spasmodic and anti-epileptic purpose. The leaves have significant analgesic and anti-bactericidal, anti-viral, antifungal, cardiotonic, haemolytic and cytotoxic activity. *C. nocturnum* is an evergreen shrub with oblong-lanceolate leaves, greenish white or creamy white coloured flowers which opening after sunset seizing very sweet scent in night. Stem is greenish in colour, thick, cylindrical, straight, fibrous, with proper nodes and internodes with numerous lenticels. The diagrammatic T.S. of the stem is more or less circular in outline. 4-5 layers of well-

developed cork followed by wide parenchymatous cortex embedded with rosette and prismatic crystals and starch grains. Underneath the cortex, pericyclic fibres are present in discontinuous ring. Vascular bundle arranged circularly, covering centrally located large pith. Greenish yellow coloured stem powder shows rosette crystals, simple starch grains, tannin content cells of cortical region, phloem fibres and fragment of pitted vessel. Stem powder contain 5.88% moisture content and the presence of secondary metabolites like alkaloid. Chromatographic study gives two spots at 366 nm. The results obtained from the pharmacognostical and phyto-pharmaceutical study can be helpful in further standardization of the plant at macroscopy as well as microscopic level.

KEY WORDS:

Ratrani, *Cestrum nocturnum*, microscopy, analytical study

INTRODUCTION

Solanaceae is also known as night shade family, consists about 90 genera and around 2800 species distributed in tropical and temperate regions of world. In India it is represented by about 15 genera and over 90 species. Many medicinally important plants belongs to this family, which belong to genera like Solanum, Physalis, Nicotiana, Hyoscyamus, Datura and so on.[1]

One of the Genus is Cestrum which consists of more than 300 species and most of them are native to warm subtropical and tropical areas of America.[2] In India, it is represented by about 150 species.[1]

Cestrum nocturnum is found in Saurashtra region of Gujarat cultivated as ornamental plants.[3] Though cultivated as ornamental plants *C. nocturnum* is said to have some folklore claims like fruits are used as anti spasmodic, and epilepsy.[4] The leaves of plant shown significant analgesic and bactericidal activity[2], anti epileptic[5], anti viral, antifungal, insecticidal, cardiotonic, haemolytic, cytotoxic activity and anti spasmodic.[6]*C. nocturnum* is also used in Chinese medicine for the treatment of burns and swelling.[2] *C. nocturnum* is a plant which is not mentioned in Ayurvedic classical texts.

C. nocturnum is evergreen shrub growing up to 4 meter tall. Leaves are dark green, simple, smooth, glossy, alternate, petiolate with ovate-oblong to oblong-lanceolate in shape, axillary cymose infloresence. The flowers are white or greenish creamy tubular. When open at night and produced cymose inflorescences. A powerful sweet perfume is released at night. The fruit is a berry 10 millimeter long and 5 millimeter in diameters and the color is amber green.[2]

Even though stem of this ornamental plant has some medicinal folklore uses, the plant yet remains unexplored in terms of pharmacognosy and preliminary phytochemical analysis. Hence, an effort has been

made to fill this lacuna with detailed Pharmacognostical study of stem, preliminary physicochemical and qualitative analysis.

MATERIAL AND METHOD

Collection and Authentification

Fresh flowering branches of *Cestrum nocturnum* L. were collected from its natural habitat from local area of Jamnagar, identified and authentified by the Pharmacognosist, IPGT & RA, Gujarat Ayurved University. Herbarium was preserved for further references with ref. number Phm. No. 6074/2012 in pharmacognosy laboratory.[7]

Morphology of *Cestrum nocturnum*

Morphological characters of *Cestrum nocturnum* whole plant were studied as per visual observation, following the standard procedure of taxonomy and verified with existing floras for authentification.[8]

Microscopic evaluation of stem

Thin free hand transverse sections of stem of *C. nocturnum* were taken and sections were first observed in distilled water with help of Quasmo binocular microscope.[9], [10]

Histochemical evaluation

Thick sections of stem treated with various reagents to detect the presence and absence of tannin, starch, calcium oxalate etc.[11]

Stem powder preparation

Stem was separated, shade dried, powdered by mechanical mixer grinder and sieved through 80 # sieve and stored in air tight glass container for further powder microscopy.[9]

Organoleptic characters of stem powder

The colour, odour and taste of stem powder were recorded separately through visual and sensory observation following standard protocol.[9]

Microscopic of stem powder

The powder samples were studied under the microscope with distilled water and also examined after staining with different suitable reagents *i.e.* phloroglucinol along with hydrochloric acid and ferric chloride. Micrometric measurements of different characters of stem powder were noted down by preloaded micrometric

scale.[9]

Physicochemical parameters

The physicochemical parameters like loss on drying, total ash, acid insoluble ash value, water extractive value and alcohol extractive value were performed as per standard protocol.[12]

Phytochemical screening

Preliminary test for detection of various chemical constituents like alkaloids, tannins, glycosides, flavonoids, carbohydrate, phenols and proteins were done as per standard protocol.[10]

RESULTS AND DISCUSSION

Morphology of *Cestrum nocturnum* plant

Taxonomically the plant is placed under the Solanaceae, available all over India cultivated as ornamental plant. The plant is 1.5-2 m tall shrubs. The leaves are about 6-15 × 1.7-5.8 cm, ovate-lanceolate. Flowers are greenish white or creamy white. Corolla 2-2.5 centimetre long with the five acute lobes 10-13 millimeters in diameter and are clustered in axil of leaves. Berries are white or deep purple. [Figure 1]

Figure 1

Figure 1.1

Figure 1.2

Macroscopy of stem

Stem of *Cestrum nocturnum* L. are thick, long, cylindrical, straight, comparatively though woody, fibrous, with proper nodes and internodes, slightly swollen at node region. Stem with numerous lenticels, greenish, the cut pieces measures about 8-10 cm in length, 1cm in circumference, outer cork greenish inner whitish, with offensive smell. [Figure 2]

Figure 2

Microscopy of stem

Diagrammatic transverse section of the stem is more or less circular in outline. 4-5 layers of well-developed cork followed by wide parenchymatous cortex embedded with rosette and prismatic crystals of calcium oxalate and starch grains. Underneath the cortex, pericyclic fibres are present in discontinuous ring. Vascular bundle arranged circularly, covering centrally located large pith. The detailed anatomy of the stem shows the following microscopic characters.

Cork: Cork is the outer most layer of the stem consists of 8-10 layers of thick walled tangentially elongated brownish coloured lignified cork cells majority of them being isodiametric in shape.

Cortex: Cortex is narrow zone consists of few layered of parenchyma cells embedded with rosette crystals of calcium oxalate, simple oval shaped starch grains, brown tannin filled cells and oil globules followed by distinct zone of pericycle.

Pericycle: Pericycle is 3-5 celled group of rectangular to oval shaped non lignified collenchymatous cells forming discontinuous ring.

Vascular bundles: Vascular bundles are bi collaterally arranged. Phloem appears like caps over the xylem, consists phloem fibres and sieve elements.

Xylem is separated by bi-seriate to multi-seriate medullary rays. Xylem vessels are spherical to oval in shape, xylem surrounded by xylem parenchyma and fibers. Thin walled elongated parenchymatous cells forms multi-serriate medullary rays filled with starch grains.

Medullary rays: Medullary rays which separate the vascular bundles, rectangular to oval shaped cells arising from pith region extends up to inner wall of the cortex region and are multi-serriate loaded with starch grains.

Pith: Pith occupies the central part of stem section consists of parenchymatous cells loaded with starch grains, oil globules and very few rosette crystals of calcium oxalate. Some of the parenchymatous cells are thick

lignified and pitted and filled with dark brown content in center. [Figure 3]

Figure 3

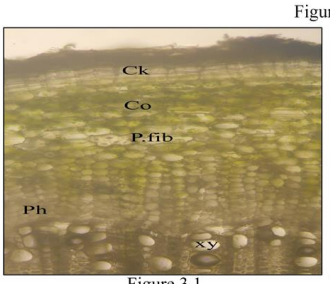


Figure 3.1

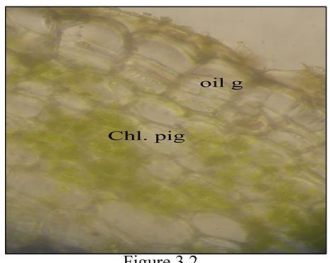


Figure 3.2

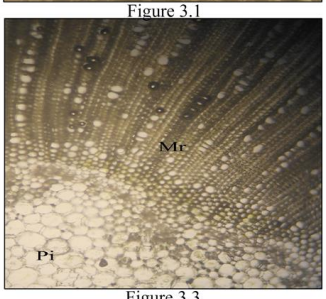


Figure 3.3

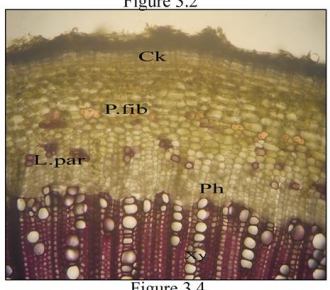


Figure 3.4

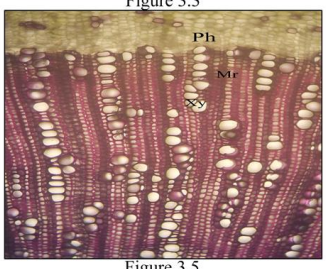


Figure 3.5

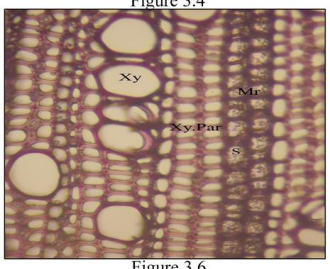


Figure 3.6

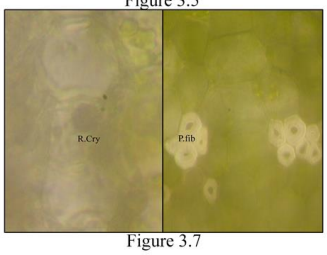


Figure 3.7

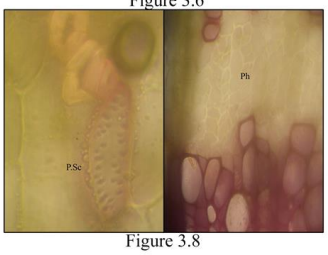


Figure 3.8

ck=cork
co=cortex
p.fib=pericyclic fibre
ph=phloem
oil g=oil globule
chl. pig=chlorophyll pigment
mr=medullary rays
pi=pith
l. par=lignified pericycle
xy=xylem
xy. Par= xylem parenchyma
r.cry=rosette crystal
p.sc=pitted sclerides

Histochemical evaluation

T.S. of stem along with powder shows presence of starch grains, calcium oxalate crystals. Other histochemical tests are depicted in table no. 1.

Table no. 1: Histochemical evaluation

Sr. No.	Reagents	Observation	Characteristics
1.	Phloroglucinol+ Conc. HCl	Red	Lignified cells
2.	Iodine	Blue (Petiole)	Starch
3.	Phloroglucinol+ Conc. HCl	Dissolved	Calcium oxalate crystals
4.	$Fecl_3$ solution	Dark blue to black	Tannin cells

5.	Sudan III	Red	Oil globules

Powder microscopy

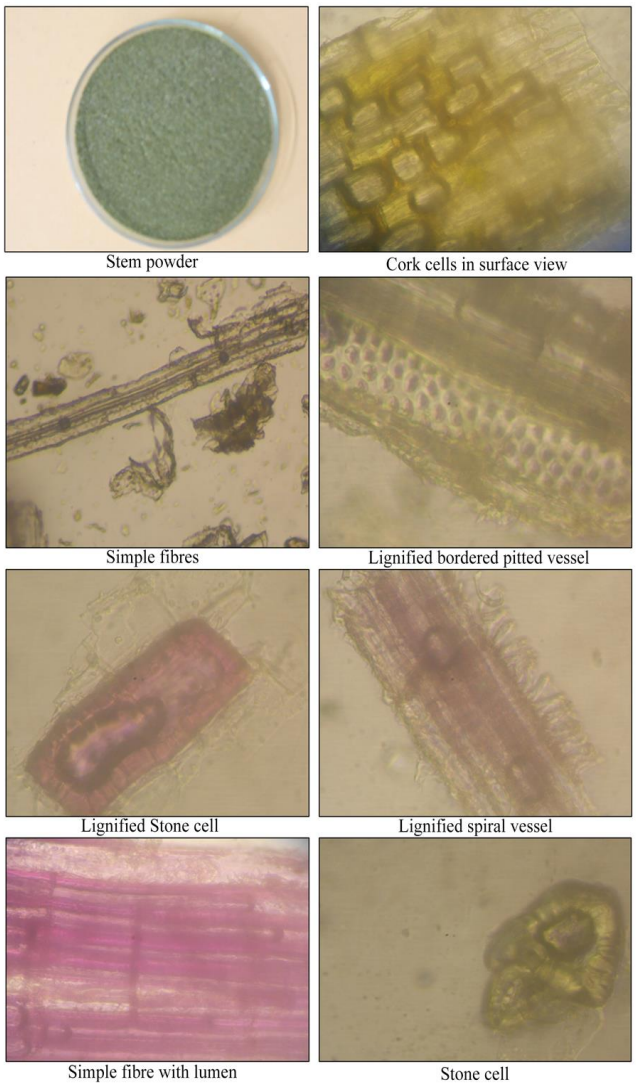
The organoleptic characters of *C. nocturnum* stem powder are depicted in the table no. 2.

Table no. 2: Organoleptic characters of Stem powder

Sr. No.	Characters	*Cestrum nocturnum*
1.	Colour	Greenish yellow
2.	Taste	Characteristic
3.	Odor	Slightly sweetish
4.	Nature of powder	Coarse

Diagnostic characters shows that cork in surface and transversely cut view, rosette crystal and parenchyma cells of cortex, radially cut medullary rays, simple starch grains from cortex and medullary rays, isolated with brownish in colour, tannin content cells of cortical region, simple fibres of phloem, and pitted vessels of stelar region. [Figure 4]

Figure 4



Physicochemical parameters

Physicochemical parameters of *C. nocturnum* stem powder included various physicochemical analysis. The moisture content in the sample is 5.88 %w/w. The other observed results are shown in the table no. 3.

Table no. 3: Physicochemical parameters of *C. nocturnum* stem powder

Sr. No.	Parameters employed	Values (%w/w)
1	Loss on drying	5.88
2	Total ash	9.87
3	Acid insoluble ash	3.042

4	Water soluble extractive	19.79
5	Alcohol soluble extractive	10.52

Phytochemical screening

C. nocturnum stem powder was qualitatively tested for the presence of different phytoconstituents. Carbohydrate, Cardiac glycoside, Flavonoid and Tannin are present in alcoholic the extract of stem. The other observed results are shown in the table no. 4.

Table no. 3: Physicochemical parameters of *C. nocturnum* stem powder

Sr. No.	Qualitative tests	Stems
1	Test for alkaloids	
	Dragendorff's reagent	+ve
	Mayer's reagent	+ve
	Wagner's reagent	+ve
2	Test for tannins	+ve
3	Test for triterpenes (steroids) (1) Salkowski reaction	-ve
4	Tests for cynogenic glycosides / sugars Molisch's test	-ve
5	Test for flavonoids / shinoda's test	-ve
6	Test for carbohydrates / Fehling's test	-ve
7	Test for phenols / neutral $FeCl_3$	+ve
8	Test for amino acids and proteins	-ve
9	Test for glycoside Legal's test	-ve

The plant *C. nocturnum* is shrub with simple alternate leaves, base unequal which are key identification characters of solanaceae family. The corolla of flower is tubular and fruits are berries which are key character of *Cestrum* genus. The corolla lobes are erect and unreflxed which specific for *nocturnum* species. Greenish coloured stem of *C. nocturnum* consists numerous lenticels, fibrous fracture with proper node and internodes.

C. nocturnum stem's transverse section shows[13] cork arising in the epidermis, presence of stone cells and

rarely presence of rosette crystals of calcium oxalate in cortical zone. Vessels exclusively uniseriate or occasionally biseriate,[13] which are key character of solanaceae family. Stem powder possess characteristic taste with greenish yellow colour and slight sweetish smell. Cork cells in surface view, lignified stone cells, fragment of lignified bordered pitted vessels and fibres with lumen are the diagnostic characters of the stem powder which indicate the maturity of the plant.

CONCLUSION

The plant '*Ratrani'*, a shrub, is botanically identified as *Cestrum nocturnum* L. belonging to the family Solanaceae based on its morphological characteristics. Transverse section of stem and its powder microscopy shows rosette crystals, stone cells, vessels and fibres are unique to the plant identity. Extractive value and presence of secondary metabolites can be used for the standardization and identification of the plant. The standard results may help for the further research study.

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