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Pharmacognostic study of *Lantana camara* Linn. root

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ABSTRACT

Objective: The study was carried out to perform the pharmacognostic evaluation of *Lantana camara* Linn. root. **Method:** The pharmacognostic evaluation was done in terms of organoleptic, macro-microscopy, fluorescence analysis and physicochemical parameters. **Results:** The characteristic macroscopic features showed that the root consists of 25-40 cm long, 0.2-4.0 cm thick pieces which are usually branched, shallow, tough, creamish-brown externally, outer surface rough due to longitudinal wrinkles, with hard fracture, characteristic odour and pungent taste. The main microscopic characters of the root shows exfoliating cork, consisting of about 10-15 rows of tangentially elongated, thick-walled cells followed by cortex consisting of polygonal parenchymatous cells, a few containing rhomboidal shaped calcium oxalate crystals. Endodermis consists of 3-4 layers of non-lignified, thick-walled rounded parenchymatous cells followed by a single layer of non-lignified pericycle. Phloem, a wide zone of xylem consisting of lignified pitted vessels and bi-to triseriate medullary rays are also present. Proximate physicochemical analysis of the root power showed loss on drying, total ash, water soluble ash, sulphated ash values as 0.52, 4.26, 3.8 and 5.8 % w/w respectively. Successive extraction of the root powder with petroleum ether, chloroform, alcohol, water yielded 0.19, 0.35, 2.19 and 2.0 % w/w respectively. Fluorescence study imparted characteristic colors to the root powder when observed under visible, short and long wavelength light. **Conclusions:** Various pharmacognostic parameters evaluated in this study helps in identification and standardization of *Lantana camara* L. root in crude form.

1. Introduction

Lantana camara Linn. (family: Verbenaceae), commonly known as wild or red sage, is a rambling perennial shrub found growing up to 2000 m altitude in tropical, sub tropical and temperate parts of the world including India with a number of flower colors viz. red, pink, white, yellow and violet[1-2]. All parts of this plant have been used traditionally for several ailments throughout the world. The roots of the plant have been used in the treatment of malaria, rheumatism, and skin rashes[3]. The roots of the plants have also been used traditionally as oral contraceptives by the women in South Africa [4]. Various biological activities reported in this plant include insecticidal[5-6], anti-microbial, immunosuppressive, antileprotic and anti tumour activities[7], antifungal[8], antimycobacterial[9] and anticancer[10] activities etc.

Previous studies have reported the presence of sesquiterpenes like curcumenes and safrole; triterpenes such as lantadenes A and B; iridoid glycosides; flavonoids like quercetin derivatives and steroids like β-sitosterol, campesterol, stigmasterol, β-sitosterolglucoside, oligosaccharides in the plant[11-13]. Earlier, pharmacognostic work on leaf of this plant was reported[14], but no such work has been performed on roots of this plant till date. Therefore, the present study was undertaken to perform the pharmacognostic study of *Lantana camara* Linn. roots.

2. Materials and Methods

2.1. Chemicals

All the chemicals used were of analytical grade and were obtained from Rankem Limited India and Hi-Media laboratories, Mumbai, India.

2.2. Procurement of Plant materials

The plant material (Figure 1) was collected from the campus of Kurukshetra University, Kurukshetra during May 2010 and authenticated by Dr. H.B Singh, NISCAIR under reference number (NISCAIR/RHMD/Consult/-2010-11/1471/69).

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Figure 1. Image of *L. camara* Linn.

2.3. Macroscopic evaluation

Various organoleptic and macroscopic characters of *L. camara* root like colour, shape, size, tase, odour, fracture and configuration etc. were evaluated[15].

2.4. Microscopic evaluation

Microscopical studies were conducted on both grounds qualitatively and quantitatively. The model of microscope used for study of different characters was SKC-400, Suswox Optik, Sudheer Scientific Works, India.

2.4.1. Qualitative microscopy

In this study, transverse sections of root were studied under photomicrograph. Staining reagents (such as phloroglucinol-HCl) were used as per reported procedures[16-17]. The various identifying features of the drug were studied with or without staining and recorded.

2.4.1.2. Root microscopy

The fresh root pieces were dipped in a test tube containing sufficient water and boiled for few minutes. The softened pieces were transversally sliced into fine sections which were subjected to staining reagent 0.1% w/v phloroglucinol followed by concentrated conc. hydrochloric acid. The stained sections were observed under microscope[18]. Different layers of cells and identifying characters were observed then photomicrography was done.

2.4.1.3. Powder microscopy

The dried root was powdered and studied under microscope. Different staining reagents (such as iodine for detection of starch grains and phloroglucinol for detection of lignified components) were used. To a little quantity of powder taken over a microscopic slide, 1-2 drops of 0.1% w/v phloroglucinol solution and a drop of concentrated hydrochloric acid were added and covered with a cover slip. The characteristic structures features of cell components were observed and their photographs were taken using photomicrography.

2.5. Fluorescence analysis

Fluorescence study of root powder was performed as per reported procedure[20]. A small quantity of the powder was placed on a grease free clean microscopic slide and 1-2 drops of the freshly prepared reagent solution were added, mixed by gentle tilting the slide and waited for 1-2 minutes. Then the slide was kept inside the UV cabinet and observed in visible light, short (254 nm) and long (365 nm) ultraviolet radiations. The colors observed by application of different reagents in different radiations were recorded.

2.6. Physicochemical analysis

In this study, air-dried root powder was used for quantitative determination of physicochemical parameters like loss on drying, total ash, acid insoluble ash, water soluble ash, sulphated ash values and extractive values *etc.* as per reported method[21].

3.Results

3.1. Macroscopic study of root

Macroscopic examination of the root (Figure 2) shows that it consists of 25-40 cm long, 0.2-4.0 cm thick pieces which are usually branched, shallow, tough, creamish-brown externally, bark thin, outer surface rough due to longitudinal wrinkles, with fracture hard, characteristic odour and pungent taste.

3.1. 2. Microscopic study of root

Transverse sections study of the root (Figure 3 a & b) show exfoliating cork, consisting of about 10-15, rows of tangentially elongated, thick-walled cells. Cortex consists of polygonal parenchymatous cells, a few containing rhomboidal shaped calcium oxalate crystals. Endodermis consists of 3-4 layers of non-lignified, thick-walled rounded parenchymatous cells. Pericycle consists of single layer of non-lignified, thin-walled rounded parenchymatous cells below the endodermis. Phloem consists of isodiametric, thin-walled, parenchymatous cells, a few containing rhomboidal crystals of calcium oxalate. Xylem shows a wide zone, consisting of lignified pitted vessels found in single as well as in groups of 2-3, scattered throughout xylem

region. Medullary rays consist of bi-to triseriate, lignified and radially elongated parenchymatous cells, narrow in the xylem region and wider in the phloem region.

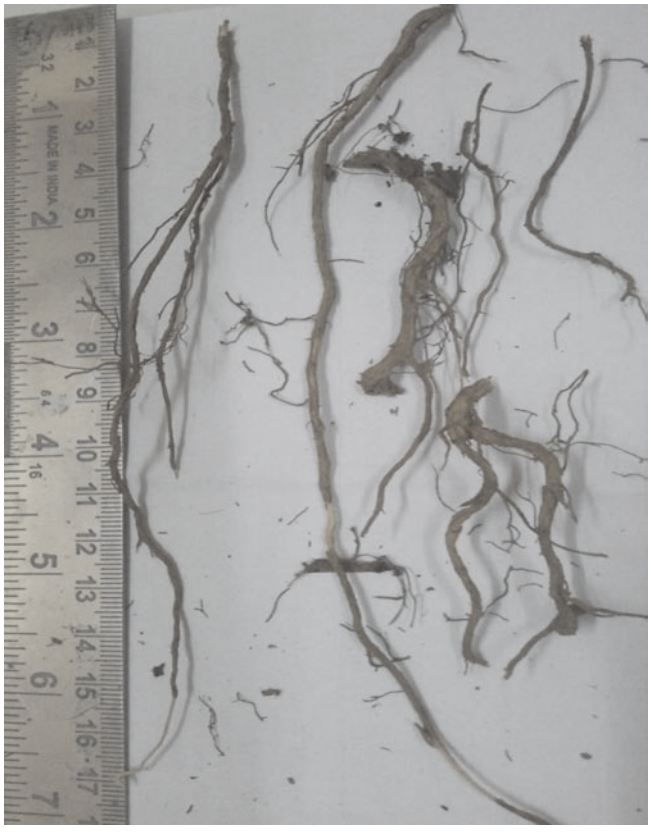

Figure 2. Image of *L. camara* roots

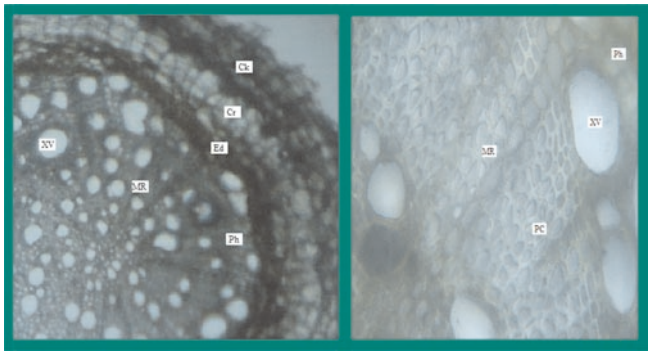

Figure 3. T.S. of *L. camara* root (a:100x; b: 450x); Ck- Cortex, Cr- Cork, Ed-Endodermis, XV-Xylem vessel, Ph-Phloem, MR-Medullary rays

3.1. 3. Powder study

Root powder appears dull yellow, showing fragments of cork cells about 4-5 rows of tangentially elongated, thick-walled cells; Cortex cell consists of thin-walled polygonal parenchymatous cells; lignified and pitted xylem vessels; non-lignified sieve tube; rhomboidal shaped calcium oxalate crystals. Powder characteristics of the root have been shown in Figure 4.

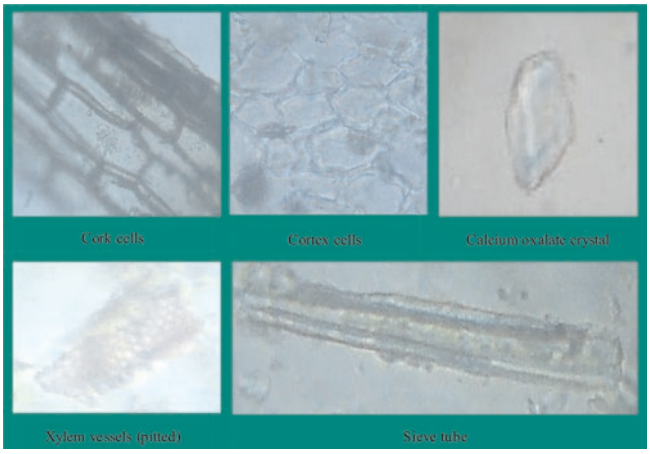

Figure 4. Powder characterstics of *L. camara* root

3.1.4. Fluorescence analysis

The fluorescence analysis of the root powder with different chemical reagents is summarized in Table 1.

Table 1

Fluorescence analysis of *L. camara* root powder

Treatment	Visible light	Under UV light	
		Short Wavelength (254 nm)	Long wavelength (365 nm)
Powder	Yellowish brown	Brown	Black
Powder + 50% NaOH (aq.)	Brown	Light green	Dark green
Powder + 50% NaOH (alc.)	Brownish green	Light green	Blackish green
Powder + Ammonia	Dark brown	Blackish green	Black
Powder + Picric acid	Pale green	Green	Dark brown
Powder + 10% HCl	Light brown	Greenish brown	Dark green
Powder + 10% H2SO4	Light brown	Blackish brown	Black

3.1.5. Physicochemical analysis

In physiochemical analysis, various parameters like loss on drying, total ash, acid insoluble ash, water soluble ash, sulphated ash values and extractive values were determined in triplicate as mentioned in Table 2.

Table 2

Physicochemical analysis of *L. camara* root

Parameters	Value obtained on dry weight basis (% w/w)*
Loss on drying	12.52± 0.05
Total Ash Value	4.26 ±0.14
Acid insoluble ash value	2.6 ± 0.35
Water soluble ash	3.8 ± 0.21
Sulphated ash	5.8 ±0.06
Alcohol soluble extractive	2.19±0.41
Water soluble extractive	2.2±0.32

*Average of three reading ± SEM

4. Discussion

Pharmacognostical evaluation of parameters like microscopy, physicochemical analysis, fluorescence analysis is necessary for standardization of herbals[22]. The identification and evaluation of the root of *Lantana camara* have been carried out and the various characteristics and features associated with it duly determined by the various analysis. The macroscopic examination reveals the physical appearance of the root, which can be seen with the naked eyes. This however gives an idea of the part and cannot be relied solely for the identification of the root of the plant. The microscopic examination gives hints about the characteristic features that could be found in different morphological parts of plants. These features and their arrangements are not always the same in all morphological parts. The presence of few calcium oxalate crystals indicates the calcium salt of oxalic acid that is present usually at about 1.0 % in plants[23]. The results obtained for ash values, which are of tremendous importance in quality control are used to detect foreign organic matter and detection of adulteration of sand or earth. The ash values obtained were adequate within the limits of experimental error since the total ash, acid-insoluble, water soluble ash and sulphated ash were determined were within the IP specifications[24-25]. The results of this study are in commensurate with lot of previous findings conducted for the standardization of plant drugs[26-29]. The extractive values are, however, moderate but will be useful for the further extraction of phytoconstituents from this plant. Fluorescence study of the root powder helps in the qualitative evaluation which can be used as a reference data for the identification of adulterations. In conclusion, the pharmacognostic parameters reported in this study will be useful in the development of pharmacopoeial standards for the future studies.

Conflict of interest statement

We declare that we have no conflict of interest.

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