PHARMACOGNOSTICAL STUDIES ON A MULTIPURPOSE MEDICINAL PLANT *LEPTADENIA RETICULATA* (RETZ.) WIGHT. & ARN.

KALIDASS. C[1*], MOHAN V R[1], & SIVALINGAM R[2]

[1]*Ethnopharmacology Unit, P.G & Research Department of Botany, V.O.Chidambaram College, Tuticorin, Tamil Nadu, India.*
[2] *Department of Botany, Bharathiar Univeristy, Coimbatore, Tamil Nadu, India.*

Corresponding author: Email: kalidassindia@gmail.com

Summary

Leptadenia reticulata have different indications in Ayurveda and are used traditionally for several ailments. Considerable as one of the important drug in Ayurveda since 4500 BC. A cooling, demulcent with light strengthening properties is used to make a tonic in traditionally treatment such as seminal discharges and snake bite. To facilitate correct and easy identification of the drug, pharmacognostical studies covering macro and microscopical studies and physicochemical constant, fluorescent analysis and phytochemical evaluations. The ash of the whole plant powered is 5.67% and an extractive value in water is more than in ethanol. Fluorescent analysis showing that 1N aqueous NaOH, 1N alcoholic NaOH, 1N HCL and 50% H_2SO_4 treated with whole plant powered shows characteristics fluorescent colour under 254nm ultraviolet light. The phytochemical investigation of alcohol extract revealed the presence of alkaloids, flavonoids, sugar, saponins and tannins compounds. These specific identities will be useful in the standardization of the drug.

Key words: *Leptadenia reticulata,* pharmacognostic study, phytochemical analysis.

Introduction

Leptadenia reticulata (Retz.) Wight. & Arn., belonging to family Asclepiadaceae, is an important medicinal species possessing abundant alkaloids [1]. Commonly known as 'dodi', is an Indian medicinal plant used since 4500 BC. The whole plant ameliorates 'tridoshas' (Vatta, Pitta and Kapha), and is of great value in general debility, involuntary seminal discharge, as a stimulant and snake bite [2-3], abortifacient, tonic, restorative, bactericidal, antifabrifuge, prostitutes, wound healer and in mouth ulcer [4]. Roots are used in many ayurvedic/herbal formulations [5] in diseases of the ear and nose, skin infections and general debility [6]. It is also used for increasing milk-yielding capacity in cattle [7-8] and to increase the egg laying capacity of hen in poultry industry. Flowers are good for eyesight.

More than 23 pharmaceutical products are available in the market containing *L. reticulata* as one of the ingredients. The plant has great demand in both the local as well as the international market, at Rs 211/- per kg of dry powder. Its flowers and tender leaves are used as vegetable [9] and to make bread [10]. Flowers are costly and are sold at Rs 80/- per kg. Stigmasterol is the major component in the extract and it also contains ß–sitosterol. The tubers contain fructosan of the insulin type and are used as vegetable [6]. Hence, the present investigations include morphological and anatomy evaluation, determination of physiochemical constants and the phytochemical screening of the different extracts of *L. reticulata* (Retz.) Wight. & Arn.

Materials and Methods

Plant material

The plant was collected in the month of November 2006 from Papanasam, Tirunelveli hills, Southern Western Ghats, Tamil Nadu, India. Plant was identified with Regional floras.

Microscopic analysis

The microscopy of the plant was studies according to the method [11]. For the microscopical study, cross sections were prepared and stained as per the procedure [12].

Physicochemical constant

Various physicochemical parameters like ash values (total ash, water soluble ash and acid-insoluble ash) and extractive values (water soluble, alcohol soluble extractives) were established using the powdered drug (Table 1) [13-14].

Fluorescence analysis

A small amount of powdered whole plant was treated with different types of chemical reagents as mentioned in Table 2 and the colour characteristics were observed under ultraviolet light (254nm and 365nm) and day light [15-16].

Phytochemical study

The powder was extracted with 500ml of different solvent at 70°C for two hours each. Various phytoconstituents present in the leaves were detected by their respective chemical tests using the appropriate extracts (Table 3) [15&17].

Observation and Discussion

Systematic position

Family	: Asclepiadaceae
Botanical Name	: *Leptadenia reticulata* (Retz.) Wight. & Arn.
Vernacular Name	: Palaikkodi, Palakudai
Common name	: Jivanti
Sanskrit	: Arkapushpi, Svarnajvanti

It is an usually woody climber, distributed commonly in the evergreen forests of the Western Ghtas in Tirunelveli, Tamil Nadu, India. Leaves elliptic – oblong or lanceolate, 4-7×1.5-3 cm, charataceous, base truncate, obtuse or rounded, apex acute; petiole to 2 cm. Umbellate cymes Ca, 15-flowered, axillary or terminal; Paduncle ca. 1 cm; bracts 4 mm; bracteoles scaly, 1.5 mm; pedicel ca. 1 cm. Calyx copular; lobes subsequal, triangular, valvate, 2 mm, characeous, acute. Corolla yellow, 5 mm across, campanulate; lobes linear–lanceolate, erect, valvate, 4 mm, coriaceous, glabrous without, beared within, recurved, acute. Pollinia suberect; pollinial bags spherical, 0.5 mm, pellucid; caudicte obscure; receptacle back, 0.1 mm. corona double; outer coralline, massive, alternating with corolla–lobes; inner staminal column. Ovaries half-inferior, 1 mm; style 0.5 mm; stigma conic, 2-fid. Follicles parired, cylindric, bluntly acute to both ends 6×2 cm; seeds oblong, winged, 3.5×1 mm; testa crustaceous; corma brownish white. Straggle to 8 m, forming dense masses on thickets. Latex watery Flowers yellowish (corolla- lobes greenish yellow, fimbriate with down-ward pointing claws inside) July –December, Fruit September onwards.

The anatomical features of the leaf and stem of *L. reticulata* are presented in plate–1. Transverse section of the leaf is dorsiventral and transcuurent. Lamina portion shows upper epidermis, which is singled layered having rectangular cells and cuticularized. Surface forming uniseriate multicellular 3–5 trichomes. Mesophyll consists of 2–3 layers of plasade parenchyma and 3–4 layers of loosely bound spongy parenchyma.

Midrib portion shows both upper and lower epidermis which is continuous. Upper converse surface is grooved and below each groove, it shows 5–6 layers of collenchyma, which are followed by double layers of embedded palisade parenchyma. Vascular bundles are arc shaped. Xylem is lignified and phloem is non-lignified.

A cross-section of the stem shows a single layer of epidermist composed of cubical cells of small dimension. A large number of epidermal cells elongate and form multicellular, uniseriate, covering trichomes. These trichomes are usually 4–5 celled, but some time upto 8 celled. They are covered with striated cuticle. Below the epidermis is the cortex, the cells being thin-walled, parenchymatous, polyheadral to circular with small intercellular spaces. The cambium produces secondary phloem on the outer side and secondary xylem on the inner side, giving rise to a continuous ring of wood. The xylem, which is represented in a very young stem by a few vessels, becomes compact later on. It is followed by intra-xylary phloem, which is located, as slightly larger group than the normal phloem. The pith is represented by large, thinwalled isodiametric parenchymatous cells. Calcium oxalate crystals as rhomands and prisms and starch grains are present in the phelloderm, phloem and the medullary rays of the mature portion.

The results of the ash and extractive values of *L. reticulata* whole plant drug powder are depicted in Table-1. The total ash content of the powdered whole plant is 1.39% and extractive value in water is more than in ethanol. Physicochemical constant is an important parameter in detecting adulteration on improper handling of drug [18]. The important in the evaluation of crude drugs, is the ash value and acid insoluble ash value determination. The total ash is particularly important in the evaluation of purity of drugs, the presence of or absence of foreign inorganic matter such as metallic salts or silica. Many phytochemical fluoresce when suitably illuminated. The fluorescence colour is specific for each compound. A non fluorescent compound may fluoresce if mixed with impurities that are fluorescent. The fluorescent method is adequately sensitive and enables the precise and accurate determination of analyze over a satisfactory concentration range without several time consuming dilution steps prior to analysis of pharmaceutical samples [19]. The results of fluorescence analysis of whole plant powder of *L. reticulata* are shown in Table-2. The whole plant powder shows the characteristic fluorescent colour, when treated with 50% H_2SO_4, nitric acid and acetic acid under short UV light. The results of preliminary phytochemical screening of petroleum ether, benzene, chloroform, and methanol extracts of whole plant of *L. reticulata* are presented in Table – 3. The methanol extracts of whole plant shows the presence of alkaloid, catachin, coumarin, phenol, saponin, tannin, terpenoids, sugar and xanthoprotein. Therapeutically terpenoids exert wide spectrum of activities such as antiseptic, stimulant, diuretic, anthelmintic, analgesic and counter-irritant [20]. Many tannin containing drugs are used in medicine as astringent. They are used in the treatment of burns as they precipitate the proteins of exposed tissues to form a protective covering [21]. They are also medically used as healing agents in inflammation, leucorrhoea, gonorrhoea, burns, piles and antidote [22]. The presence of steroidal saponins like, cardiac glycosides appear to be confined to many families and these saponins have great pharmaceutical importance because of their relationship to compounds such as the sex hormones, cortisones, diuretic steroids, vitamin D etc., [23-24]. From plant saponin compound in this plant which is supported the usefulness of this plant in the managing inflammation.

Since the plants, *Leptadenia reticulata* are useful in traditional medicine for the treatment of various ailments. The morphology of the entire plant, anatomy of the leaf and stem and the physicochemical standards of the whole plant powder given in the present study can be used to identify the crude drug. The pharmacognostic constant for the various parts of above said plant, the diagnostic microscopic features and the numerical standards reported in this work could be useful for the compilation of a suitable monograph for it proper identification.

Table 1: Ash and extractive values of the powdered whole plant of *Leptadenia reticulata*

Type of Ash	**% of Ash**
Total ash value of powder	5.67±0.57
Water soluble ash	0.92±0.09
Acid insoluble ash	0.78±0.11
Sulphated ash	8.64±1.26
Nature of extract	**Extractive value (%)**
Alcohol (Ethonolic)	7.58±0.59
Water (Aqueous)	18.92±0.76

Table 2: Fluorescence analysis of the powdered whole plant of *Leptadenia reticulata*

Experiments	Visible/Day light	UV Light	
		254nm	365nm
Drug powder as such	Yellowish green	Green	Dark green
Powder + 1N NaOH (aqueous)	Light green	Brownish yellow	Light brown
Powder + 1N NaOH (alcohol)	Yellowish green	Fluorescent green	Brown
Powder + 1N HCL	Dark green	Brown	Green
Powder + 50% H_2So_4	Blackish green	Fluorescent yellow	Dark green

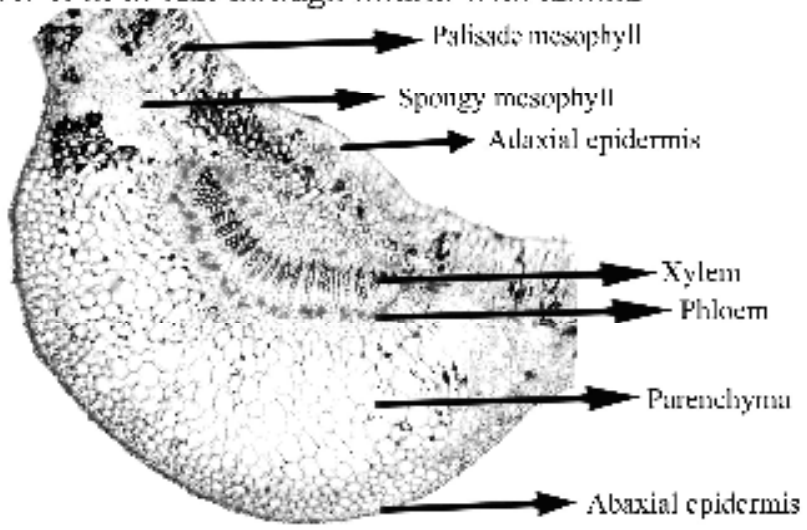
Table 3: Qualitative Screening of Phytochemicals from *Leptadenia reticulata*

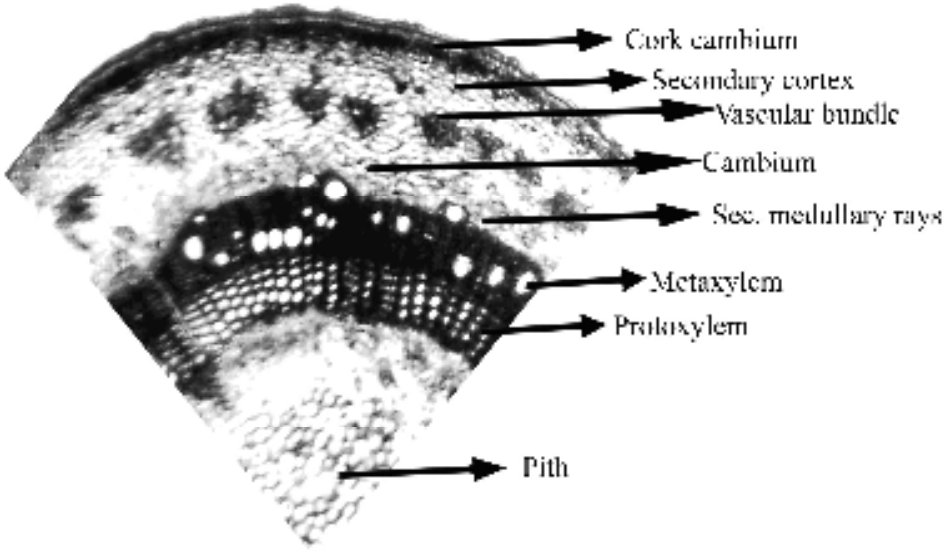
	Petroleum ether	**Chloroform**	**Acetone**	**Alcohol**	**Aqueous**
Alkaloids	-	+	-	+	+
Flavonoids	-	-	-	+	-
Steroids	-	+	+	-	+
Sugar	+	+	+	+	+
Phenolicgroup	+	-	+	-	-
Saponins	-	-	-	+	-
Tannins	-	-	-	+	+

(+) = indicates presence of a phytochemicals. (-) = indicates absence of a phytochemicals.

Plate 1

A: T. S. of leaf through midrib with lamina





B: T. S. of stem - protion enlarged

References

1. Anonymous. 1962. The Wealth of India, A Dictionary of Indian Raw Materials and Industrial products, Vol. VI: L –M (CSIR): New Delhi, India).
2. Dandiya PC, Chopra YM. 1970. CNS-active drugs from plants indigenous to India. Indian J. Pharm., 2:67–90.

3. Bhatt T, Jain V, Jayathirtha MG, Banerjee G, Mishra SH. 2006. *In vitro* regeneration of roots of *Phyla nodiflora* and *Leptadenia reticulata*, and comparison of roots from cultured and natural plants for secondary metabolites. Indian J. Exp. Biol., 40:1382–1386.
4. Vaidya BG, Nighantu A. 1965. Shri Swami Atmanand Saraswati Ayurved Sahakari Pharmacy Ltd, Surat, 2: p.1106.
5. Anon. 1978. *Ayurvedic Formulary of India*, Govt of India Press, Faridabad, 1978, Part-I, 1st edn, p. 30.
6. Kirtikar KR, Basu BD. 1998. *Indian Medicinal Plants*, Bishen Singh Mahendra Pal Singh, Dehradun, 2nd Edn, 7:2246–2247.
7. Anjaria, JV, Gupta I. 1967. Studies on lactogenic property of *Leptadenia reticulata* (Jivanti) and leptaden tablets in goats, sheep, cows and buffaloes. Indian Vet. J., 44: 967–974.
8. Anjaria JV, Varia MR, Janakiraman K, Gulati OD. 1975. Studies on *Leptadenia reticulata*: Lactogenic effects on rats. Indian J. Exp. Biol., 13:448–449.
9. Shortt J. 1887. List of wild plants and vegetables used as food by people in famine times. Indian For., 3: 232–238.
10. Gammie, Alexander G. 1902. A note on plants used for food during famines and seasons of scarcity in the Bombay Presidency. India Bot. Surv., 2:171–196.
11. Brain KR, Turner TD. 1975. The Practical Evaluation of Phytopharmaceuticals, Wright – Scientechnica, Bristol, 4 – 9.
12. Johansen DA. 1940. Plant Microtechnique. McGraw – Hill Book Company, Inc. New York and London, 1-523.
13. African Pharmacopoeia. 1986. General Methods for Analysis, Ist ed. 2: (OAU/STRC) Lagos. p. 123.
14. Anonymous. 1996. Indian Pharmacopoeia, Vol. I & II. Government of India, Ministry of Health and Family Welfare, the Controller of Publications, Civil Lines, Delhi – 110054.
15. Lala PK. 1993. Lab Manuals of Pharmacognosy, CSI Publishers and Distributors, Culcutta, 5th Edition.
16. Mukherjee PK. 2002. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. 1st Ed., New Delhi: Business Horizons, p. 164 – 171.
17. Brindha P, Sasikala P, Purushothaman KK. 1981. Pharmacognostic studies on Merugan kizhangu. Bull. Med. Ethn. Res., 3: 84-96.
18. Anonymous. 1985. Indian Pharmacopoeia, 3rd ed. Vol.2, Govt. of India, Ministry of Health, Controller of publications, New Delhi, 1985, A74 –A75.
19. Pimenta AM, Montenegro MC, Araujo AN, Martinez JC. 2006. Application of sequential injections analysis to pharmaceutical analysis. J. Pharm. Biomed. Anul. 40:16-34.
20. Gokhale SG, Kokate CK, Purohit AP. 2003. A text Book of Pharmacognosy, Nirali Prakashan, Pune.
21. Handa SS, Kapoor VK. 1992. (Eds): Pharmacognosy, Vallabah Prakashan Publications, New Delhi. p. 51.
22. Ali M. 1994. Text book of Pharmacognosy. CBS Publishers and Distributors, New Delhi, p. 405.
23. Evans WC, Saunders WB. 2001. Trease and Evan's Pharmacognosy Tokyo. p.1- 579.
24. Okwu DE. 2001. Evaluation of the chemical composition of indigenous spices and flvoring agents. Global. J. pure and Applied Sciences, 7:455–459.