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Leptadenia reticulata a Rasayana Herbs: A Review

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Abstract: *Leptadenia reticulata* is very valuable medicinal plant belonging to family Asclepiadaceae popularly known as Jivanti. It is specially known for its stimulant and restorative properties in Ayurveda and it also important constituent of many well reputed ayurvedic formulations like Chywanprash, Speman etc. Its principal constituents are leptadenol, leptidin β-sitosterol, β-amyrin acetate. It possesses the appetizer, aphrodisiac, anticancerous and antibacterial properties. This review is to compile its valuable properties and pharmacological activities under one platform.

Key words: *Leptadenia reticulata*, stimulant, Chywanprash, Speman

INTRODUCTION

Herbs are concentrated foods that provide vitamins, minerals and other nutrients that sustain and strengthen the human body. They have been used by man since the beginning of our existence and have passed the test of time. History is an excellent source of herbal knowledge. Today's health-conscious public is now realizing that herbs, in conjunction with a proper diet and exercise program, can help them to achieve good health. Rasayana is one of the classes of Ayurveda that improve the general health of the body. Rasayan nourishes and rejuvenates the body and increases longevity, memory enhancement, immunomodulation and adoption (Chauhan *et al*., 2010). Herbs are a natural path to good health such as JIVANTI (or svarnajivantz) in Sanskrit literature, the name (jiv = life) indicates that the plant is considered to have the ability to bestow health and vigour. It is considered to be a rasayana and included among the 10 drugs constituting the jvaniya gana or 'vitalising group.

Leptadenia reticulata Wight and Am. is a much branched twining shrub of family Asclepiadaceae. Flowers are greenish yellow, in many flowered cymes (in lateral or subaxillary cymes), the follicles are sub woody and turgid. Stem is cylindrical and bent occasionally at places. It is 5 to 10 cm long, 0.5 to 2.5 cm in diameter. The surface is rough, longitudinally ridged, wrinkled and furrowed, transversely cracked and with vertically elongated lenticels at places. Externally whitish brown, internally pale brown, fracture short and splintery, odor and taste are not characteristics. The bark is yellowish brown, corky, deeply cracked. Leaves are ovate to cordate, 4 to 7.5 cm long, 2 to 5 cm broad, entire, acute, subacute to mucronate, base symmetrical, petiole 1 to 3 cm long, glabrous above and pubescent below, green colour taste and odour not characteristics (Fig. 1). The roots are externally rough, white or buff colored with longitudinal ridges and furrows and in transverse section the wide cork, lignified stone cell layers and medullary rays can be seen. The root size varies from 3 to 10 cm in length and 1.5 to 5 cm in diameter. Flowering occurs in May and June, while fruiting begins in October and continues up to November (Satyavati *et al*., 1987; Khare, 2004; Gupta *et al*., 2005; Gupta, 1997).

Fig. 1: Aerial part of *Leptadenia reticulata*

HABIT AND HABITAT

It grows in the sub-Himalayan tracts of Punjab, Utter Pradesh and throughout the Deccan Peninsula up to an altitude of 900 m and found particularly in hedges in India. It is also distributed throughout Mauritius, Medagascar, Sri Lanka, The Himalayas and Burma.

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TRADITIONAL USES

The plant is a stimulant and restorative. The leaves and roots are used in skin infections such as ringworm, wounds, nose and also in ear disorders, asthma and in the treatment of habitual abortion in women. It is cold, sweet, aphrodisiac, rejuvenative and improves digestive process. According to Ayurveda, it is a tonic given in weak debility and such similar conditions. Commonly, given for those suffering from weak debility or a lack of energy. It gives general strength to the body. Extracts of roots and leaves of the plant act as antibacterial and anti-fungal agent (Patel and Dantwala, 1958). Plant possesses the potent lactogenic, anabolic and galactogogue effect (Anjaria *et al*., 1975; Ravishankar and Shukla, 2007; Anjaria *et al*., 1974). It promotes health and vigour, improves voice and alleviates the three dosas vata, pitta and kapha. It also cures eye diseases, hematemesis, emaciation, cough, dyspnoea, fever and burning sensation. It is also used as a tonic and restorative and stimulant property (Kritikar and Busu, 1933; Gibson, 1949; Nadkarni, 1927; Nadkarni, 1954; Chopra *et al*., 1956, 1958). It is one of the ingredients of patent Siladan which is claimed to be used in different kinds of mental disorders like sex-neurosis (Hakim, 1964). The shαk (food preparation) of the plant in the doses of 50 g is beneficial in diarrhea along with curd and ghee, it is also good at the same dose in caterect along with ghee. Decoction of Jivanti root should be taken in the dose of 20 mL for relief in burning sensation due to fever. The bark leaves and whole plant are used to improve decreased milk flow in ruminants. The whole plant is also used to stimulate heat and prevent abortion. The leaves are used to treat eye diseases in swine. *L. reticulata* is a ingredient of chyawanprash, a traditional Polyherbal formulation (Kasar *et al*., 2007).

Classification:

Kingdom	:	Plantae
Class	:	Angiospermae
Cladus	:	Eudicots
Order	:	Gentianales
Family	:	Ascelpidiaceae
Subfamilia	:	Asclepiadoideae
tribe	:	Ceropegieae
subtribe	:	Leptadeniinae
Genus	:	*Leptadenia*
Species	:	*reticulata*

Indian synonymes: Bengoli: Bhadjivai, English: Leptadenia, Gujarati: Dodi, Radarudi, Hindi: Dodi, Kannada: Hiriyahalle, Marathi: Hiranvel, Sanskrit: Jivanti, Tamil: Palaikkodi, Telagu: Kalasa.

PHARMACOLOGICAL ACTIVITIES

Vasodilator: Agarwal *et al*. (1960) demonstrated the vasodilator, transient negative inotropic, chronotropic and prolonged hypotensive effect of aqueous extract of stem of *Leptadenia reticulata* in dogs.

Antidepressant: Hakim (1964) reported the use of *Leptadenia reticulata* in the antidepressant drug named as Malkanguni. The constituents of Malkanguni was *Celatsrus paniculata*, *Acorns calamus*, *Nardostachys jatamansi*, *Leptadenia reticulata.* Usual dose of the drug was 10 to 15 min per day. In some Ayurvedic literature the dose was up to 60 min per day. The drug is effective without any side effect against for depression and also showed marked improvement in histeria.

Toxicity study: Anjaria and Gupta (1967) reported the toxicity study of *Leptadenia reticulata* aqueous extract. During acute toxicity study aqueous extract and leptaden administered orally for three alternate days and three consecutive days to rats which the dose safely tolerated up to 3.125 g kg^{-1}. An high in dose led to an increase in mortality.

Anti-abortificant: Achari and Sinha (1966) clinically trialed the use of leptaden in treatment of threatened and recurrent abortion. Leptaden is a herbal drug and each tablet consists of *Jeevanti* (*Leptadenia reticulata*) 150 mg and *Kamboji* (*Breynia patens*) 150 mg. During the trial period all the patients having known history of abortion were provided the Leptaden: 2 tablets t.d.s. and Progesterone (depot) 125 mg. I.M. was given once a week till 22nd week of pregnancy. They did not receive any other hormone treatment. Leptaden with Progesterone seem to have brought down the incidence of recurrent abortion. Safe and simple dosage of Leptaden is an additional advantage for its use throughout pregnancy.

Oligospermic treatment: Madaan and Madaan (1985) studied and evaluated the Speman tablets in the cases of oligospermia. Speman tablets (of The Himalaya Drug Co.) contains many reputed ayurvedic medicinal plants, *Leptadenia reticulata* is one of them with a composition of 32 mg in each tablate. During the experiment it was provided 2 t.i.d. orally for 3 months to the oligospermia patients. It was observed that the spemen remarkably improved the total count and the motility of the sperms.

Speman is proved to be economical and very effective without any side-effects in ameliorating oligospermia.

Prostatic hyperplasia: Speman a Ayurvedic preparation consist of leptadenia reticulata (whole plant without roots) 16 mg kg^{-1} Qty. per tab. is used for the treatment of Benign Prostatic Hyperplasia. when the tablet of Speman (325 mg) (as informed by the manufacturer, The Himalaya Drug Co., Bombay) was given to the patients of benign prostatic hyperplasia, the drug bring about symptomatic relief by improving dynamics of micturation which is disturbed in BEP(Marya *et al*., 1995).

Antianaphylactic effect: Padmalatha *et al*. (2002) studied the antianaphylactic effect of DLH-3041 (polyherbal formulation) on the rat mesenteric mast cells. DLH-3041 (Himalaya Drug Company, Bangalore) is a herbal formulation. *Leptadenia reticulata* (stem) is one of the content plant of this formulation. DLH-3041 showed beneficial effect on degranulation actively and passively sensitized mesenteric mast cells.

Anticancerous activity: Sathiyanarayanan *et al*. (2007) evaluate the effect of ethanolic extract of *Leptadenia reticulate* leaves (LELR) against Dalton's Ascitic Lymphoma (DAL). It was found that the ethanolic extract of leaves (200 mg kg^{-1}, i.p.) causes a significant increase in the life span and a decrease in the cancer cell number and tumour weight. The extract also normalized the hematological parameters. The decrease in the cancer cell number observed in the LELR treated group indicates that the test drug is having significant inhibitory effect on the tumor cell proliferation.

Anti-implantation activity: Rani *et al*. (2009) studied anti-implantation and hormonal activities of the ethanolic extract of the whole plants of *Leptadenia reticulate*. Ethanolic extract of the plant (300 mg kg^{-1}) exhibited the strong anti-implantation (inhibition 100%) and uterotropic activity but no antiestrogenic activity was detected. It also induces a significant increase in the weight of genital organs of ovariactomized rats.

Antimicrobial activity: Vaghasiya and Chanda (2007) studied the antimicrobial activity of methanol and acetone extracts of *Leptadenia reticulata* against five Gram-positive bacteria. The acetone extract of *L. reticulate*, did not show any activity against the five Gram-positive bacteria investigated, while the methanol extracts showed strong bactericidal activity.

Cardiovascular activity: Mehrotra *et al*. (2007) explored that a large number of medicinal plants are used in Ayurveda, depending on the Doshas affecting the Hrd Rog (cardiac disorder), or to reduce obesity (Medorog) or inflammation (Shoth) are described. All these plants are used in Ayurved for the management of CVS disorders as per the specific etiology of the patient according to Ayurvedic principles. *Leptadenia reticulate* is one of the plants used for curing heart disease and also act as hypotensive.

FORMULATION OF JIVANTI

Jivanti is a component of many gerbil preparations which are used for /against wide range of ailments /physiological disorders. The list is Amritprasha, Anutaila, Ashokaghrita, Balarishta, Brahma rasayana, Chyavanprashaleha, Madhuyastyaditail, Shatawaryadighrita, Sukumaram kashyam, Vidaryadi ghrita, Vidaryadi kashyam, Spemen, Leptaden.

PHYTOCHEMICAL STUDIES

Leptadenia reticulata Wight and Am. is a branched twining shrub of family Asclepiadaceae contains many important phytoconstituents of plants. Major constituents of plants are α-amyrin, β-amyrin, ferulic acid, luteolin, diosmetin, rutin, β-sitosterol, stigmasterol, hentriacontanol, a triterpene alcohol simiarenol, apigenin (Krishna *et al*., 1975; Subramanian and Lakshmanan, 1977; Sastry *et al*., 1985). Some other are pregnane glycosides reticulin, deniculatin, leptaculatin isolated from aerial parts which on hydrolysis give calogenin tocopherols. Other are acetyl alcohol, lupanol 3-O diglucoside, leptidine 1, saponins, flavonoid, luteolin, diosmtin and tannin. Leaves contain two resins and also a bitter neutral principle,albuminous and colourinsing matter, Ca-oxalate, glucose, carbohydrate and tartaric acid (Sastry *et al*., 1985). The structure of three novel pregnane glycosides viz., Reticulin (1), Deniculatin (2) and Leptaculatin (3) isolated from *Leptadenia reticulata* (fam. Asclepiadaceae) were elucidated with modern physico-chemical methods and chemical transformations. (1), (2) and (3) were defined as calogenin-3-O- β-cymaropyranosyl-(1>4)-O-3-O-methyl-α-D-galactopyranosyl-(1→4)-O-β-D-digitoxopyranosyl-(1→4)-O-β-D-cymaropyranoside, calogenin-3-O-3-O- methyl-α-D-galactopyranosyl-(1→4)-O-β-D- digitoxopyranoside and calogenin-3-O-β-D-glucopyranosyl- (1→4)-O-β-D-glucopyranosyl-(1→4)-O-β-D- cymaropyranoside, respectively (Srivastav *et al*., 1994) (Fig. 2). The preliminary phytoconstituent studies of aerial part of *L. reticulata* consist of 6-7% moisture, 17.5% total nitrogen, different flavonoids, moisture (6-7%); total ash

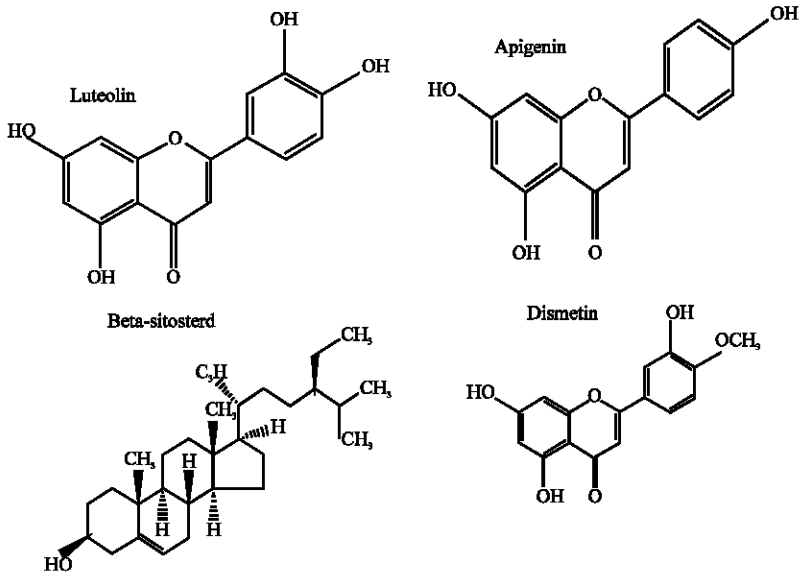

Fig. 2: Chemical constituent of *Leptadenia reticulate*

(5.5 to 6.5%); insoluble ash (0.1%), calcium 0.6%), sodium and potassium calculated as chlorides (2.16 to 2.24%), reducing sugars aldohexos, ketohexoses and pentoses, other constituents like proteins, gums, a steam volatile unidentified ferric (Fe+++) greening substance and a substance which holds reducing sugars molecules in glycosidal linkage. They also indicated the absence of alkaloids, tannins, free catechol, starches, flavonoids and saponins in its aqueous extract (Verma and Agarwal, 1962). Prashanth *et al.* (2003) developed a sensitive High-performance Thin-Layer Chromatographic (HPTLC) method for estimation of rutin. The method was validated for precision (intra-and inter-day), repeatability and accuracy and then adopted for estimation of the rutin content of the leaves of *Leptadenia reticulata.* Hamrapurkar and Karishma (2007) developed two high-performance thin-layer chromatographic methods for separate quantitative analysis of stigmasterol and dl-α-tocopherol acetate, two marker compounds in *Leptadenia reticulata*. The methods are rapid, simple and accurate and can be used for routine quality testing.

TISSUE CULTURE

Arya *et al.* (2003), developed a micropropagation method for *L. reticulata.* The nodal shoot segments were surface-sterilized and cultured on Murashige and Skoog (MS) medium along with additives containing 0.6 μM indole-3-acetic acid (IAA) and 9 μM N6-henzyladenine (BA). Three to four shoots differentiated from each node within 25-30 day at 26±2°C and 36 μmol m^2 sec^{-1} spectral flux photon (SFP) for 12hd-1. Shoots were further multiplied by repeated transfer of mother explant on fresh medium and subculture of *in vitro*-differentiated shoots on MS medium with BA and IAA. After three or four subcultures, the basal clump with shoot bases was divided into three or four subclumps and multiplied on the fresh medium. From each clump 15-20 shoots regenerated within 25 day. The plantlets were transferred to bottles containing sterile 'soilrite' moistened with halt-strength MS macrosalts. Plantlets were hardened in the bottles within 15 day. The plants were then transferred to the field. Martin (2004) attempted the Plant regeneration through indirect somatic embryogenesis from leaf, internode, node and shoot-tip derived callus of *Leptadenia reticulata*. Somatic embryos at the highest frequency was induced on Murashige and Skoog (MS) medium supplemented with 8.87 μM benzyladenine (BA) and 2.46 μM indole-3-butyric acid (IBA). From different explants, only shoot-tip and node explant derived calli induced somatic embryos. Transfer of the embryogenic callus to suspension cultures of the same concentration of growth regulators facilitated the development of embryos. Suspension cultures with reduced concentration of BA (2.22 μM) either alone or in combination with 0.49 μM IBA fostered maturation of embryos. Half-strength MS solid medium with 1.44 μM GA^3 and BA (0.22 or 0.44 μM) facilitated conversion of embryos into plantlets at higher rate compared to that with BA alone. About 77 plantlets were recovered from 10 mg callus. Plantlets transferred to small cups and subsequently to field survived in 80%. All the plantlets established in the

field exhibited morphological characters similar to that of the mother plant. Rathore and Shekhawat (2009) studied the biotechnological approaches for conservation of germplasm, problems of propagation and sustainable utilization of some important Asclepiadaceae plants of Indian Thar Desert. Cultures of *L. reticulata* were established by using hard and juvenile nodal shoot segments from plants maintained in the net house. Healthy nodal stem segments each with 2-3 nodes were pretreated with 0.1% Bavistin for 30 min and then with 0.1% tetracycline solution prepared in autoclaved distilled water for 15 min. This was followed by 0.1% HgCl for 4-5 min depending upon the type(s)/nature of explants. The surface sterilized explants were thoroughly washed 6-8 times with sterile water. These were then inoculated vertically on MS medium containing 0.8% agar and 3% sucrose + additives (283.50 μM ascorbic acid + 119.0 μM citric acid) supplemented with Benzylaminopurine (BAP, 2.22-44.40 μM), Kinetin (4.65-23.20 μM) Adenine sulphate (AS, 27.10-135.50 μM). Plant tissue and cell culture has an important role to play in solving the problems related to plant improvement. Cell and tissue culture technology if suitably developed may help improve system productivity.

CONCLUSION

The plant is the one of the ingredient of many formulations which have been used to recover from physiological, bacterial diseases or even form cancer. Only few researchers worked on the different extracts of the plant on few of the diseases occurring in human being. Still many pharmacological activities of the plant remain to be explored. Its antioxidant immunomodulatory and anticancerous activities could be correlated with its components like flavonoids, glycosides etc.

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