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COMPREHENSIVE REVIEW OF *LEPTADENIA RETICULATA*

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ABSTRACT

Leptadenia Reticulata well-known in Ayurveda for its lactogenic, restorative, and energizing qualities. This plant contain Numerous commercial herbal preparations, such as Speman, Envirocare, Calshakti, Antisept, and Chyawanprash. This perennial herb, which is native to India and is a member of the Apocynaceae family, is widely used for its medicinal qualities. In traditional medicine, it has been used to treat a variety of conditions related to the respiratory system, wounds, inflammation, coughing, dehydration, TB, colitis, chickenpox, dysentery, eye conditions, night blindness, fever, and snake bites. Jivanticontains a number of powerful compounds, such as β-sitosterol, γ-sitosterol, phytol, α-amyrin, β-amyrin, apigenin, reticulin, deniculatin, leptaculatin, diosmetin, and rutin, which have been linked to a number of pharmacological activities, such as antidiabetic, antimicrobial, antioxidant, anti-analgesic, anti-inflammatory, and antiulcer activity.

KEYWORDS: *LeptadeniaReticulata*, *Apocynaceae*, Antimicrobial, Lactogenic, Perennial, α- amyrin, Jivanti.

INTRODUCTION

It has long recognized the therapeutic benefits of *Leptadenia Reticulata*, and they have been used in many traditional medical systems, such as Ayurveda, Homeopathy, Siddha, Unani, Naturopathy, and Chinese, Tibetan, and Native American medicine.[1] *L. reticulata* is also helpful in lowering overall debility, involuntary seminal discharge, stimulating the body, and mending snake bites, In addition to being recognized to balance the

"tridoshas" (Vata, Pitta, and Kapha).[2] Hentriacontanol, α-amyrin, β-amyrin, and stigmasterol were extracted and identified from the leaves and twigs of *Leptadenia reticulata*. Diosmetin and luteolin, two more flavones, were separated and described using spectroscopic and chemical techniques.[3] The perennial, highly branching, twining, lactiferous climber *Leptadenia reticulata* (Apocynaceae), often known as "Jivanti," is found in both northern and southern India and is used to treat medical conditions. Because of its many qualities and the high market value of its raw materials, *L. reticulata* is becoming more and more useful. The Wildlife Institute of India currently lists *L. reticulata* as endangered under the special habitats and threatened plants of India list. Antiabortifacient, galactagogues, antiimplantation, antibacterial, antioxidant, anticancer, immunomodulatory, antiepileptic potential, analgesic, and antipyretic properties are just a few of its many biological functions. Numerous phenolic chemicals, glycosides, and flavonoids were identified in the plant's phytochemical composition. Apigenin, rutin, quercerin, β-sitosterol, stigmasterol, hentriacontanol, simiarenol, α-amyrin, β-amyrin, ferulic acid, diosmetin, alkaloids, and phenolic compounds were among the many bioactive substances that were extracted from *L. reticulata*. A number of compounds found in *L. reticulata*, including terpenoids, fatty acids, and steroids (campesterol, γ-sitosterol), have been shown to have anticancer properties. According to reports, the anti-inflammatory properties of medicinal plants are caused by their phenolic and flavonoid content, which reduces inflammatory cytokines and induces free radical scavenging activity.[2]

Plant Profile

Biological Source

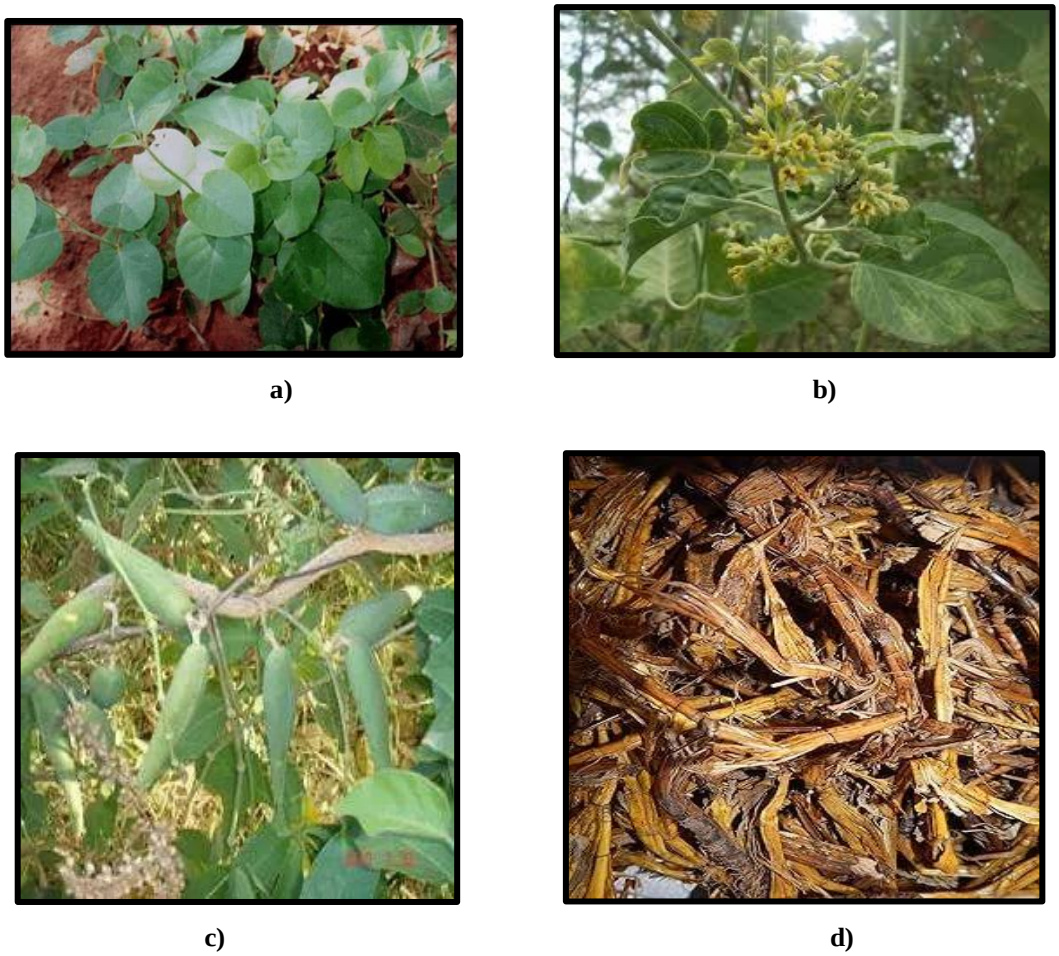
The plant family *Apocynaceae* includes the Ayurvedic herb *L. reticulata* (Jivanti). It is mostly found in the Himalayan mountains, the Deccan Plateau, the Konkan ranges, the Himalayan states of Rajasthan, Gujarat, Punjab, Sikkim, Karnataka, and Kerala, up to a height of 2000 meters.[4] The twining shrub Leptadenia reticulata (Retz.) Wight & Arn. is the biological source of Leptadenia reticulata.

Synonyms

Dori, Bhadjivai ,Jiwanti or Jeevanti, Methidodi, Dodi saka/Dodi Saag, Dori, Haranvel, Hiranvel, Madhusrava, Jivniya, Jivapushpa or Jivani, Palaikkodi, Kalasa.[1]

Images

Figure No. 1: Whole plant image of *L. Reticulata.*



a) **b)**

c) **d)**

Fig. No. 2: Different parts of *L. Reticulata*. a) Leaves, b) Flowers, c) Dried form, d)Fruits

Chemical Constituents[2]

Many bioactive components, including α-amyrin, β-amyrin, ferulic acid, luteolin, diosmetin, rutin, β-sitosterol, stigmasterol, hentricontanol, a triterpene alcohol called simiarenol, apigenin, reticulin, deniculatin, and leptaculatin, are present in this herb, which gives it its therapeutic potential. The phytochemical composition of the plant was found to have a large number of flavonoids, glycosides, and phenolic compounds. Numerous bioactive chemicals were isolated from *L. reticulata*, including rutin, quercerin, β-sitosterol, stigmasterol, hentriacontanol, simiarenol, α-amyrin, β-amyrin, ferulic acid, diosmetin, alkaloids, and phenolic compounds. It has been demonstrated that certain substances present in *L. reticulata,* including as terpenoids, fatty acids, and steroids (campesterol, γ-sitosterol), have anticancer effects. The phenolic and flavonoid content of medicinal plants is said to be responsible for their anti-inflammatory qualities, as it lowers inflammatory cytokines and promotes free radical scavenging action.

Taxonomical Classification[1]

The *Apocynaceae*family of plants includes the Ayurvedic herb *L. reticulata*, often known as Jivanti. Here is a full description of its taxonomic position:

Kingdom: *Viridiplantae*

Phylum: *Streptophyta*

Class: *Magnoliopsida*

Order: *Gentianales*

Family: *Apocynaceae*

Sub-family: *Asclepiadoideae*

Genus: *Leptadenia*

Species: *Leptadenia reticulata (Retz.) Wight &Arn.*

Morphology[10]

It is a laticiferous, twining, perennial climber with many branches. Younger stems are greenish transparent, whereas mature stems have extensively broken bark and are pale yellowish. The leaves are simple, opposite, elliptical or oval-oblong (3–9 cm × 1.1 cm), cordate, large (4–7.5 cm long and 2–5 cm wide), and finely hairy above.[4] The follicular, subwoody, turgid fruit is green, tapering, and ranges in length from 6.3 to 9 cm. Fruits can have up to 448 seeds and take 102–158 days to mature. The ovate-oblong seeds taper to a diameter of roughly 6 mm.

Geographical Distribution

In India *Jivanti* is located up to 2000 meters above sea level,and it is mostyfound in Rajasthan, Gujarat, Punjab, the Himalayan ranges, Khasi Hills, Sikkim, the Deccan Plateau, the Konkan mountains, Karnataka, and Kerala. In addition to India, it is said to be found in Burma, Nepal, Sri Lanka, the Malay Peninsula, Cambodia, the Philippines, Mauritius, Madagascar, and tropical and subtropical regions of Africa.[7] The plant requires moderate rainfall and relative humidity for optimal growth in tropical and subtropical climates. Additionally, this plant grows in arid areas, which are defined by poor organic matter, sandy soil, and insufficient rainfall.Following an extensive field investigation across 12 districts in Western Rajasthan (Indian Thar Desert), Panwar and Tarafdar documented the presence of L. reticulata in a number of the districts.[8] Additionally, this species was found on the lower slopes of hills, in open woodlands, and on hedges. In some regions of India, it is grown commercially due to its great demand.[9]

Therapeutic Uses

1. A cold infusion made from *Leptadenia reticulata* is administered to alleviate burning and difficult micturition.
2. The decoction of the plant is given with honey to treat cough.
3. The tender stems and fruits are eaten as vegetables, which helps in the improvement of the vision.
4. Fresh juice or cold infusion of the plant is given to increase the breast milk in lactating women.
5. The decoction of the root of *Leptadenia reticulata* is given with Ghee to treat fever.

Advantages

1. *L. reticulata*has great demand in both local and international market, with dry powder.[5]
2. With its lactogenic, energizing, and renewing properties, L. reticulata can be the primary ingredient in a variety of herbal preparations.[1]
3. Its enhanced large-scale field cultivation is supported by well-documented agronomic techniques, including crop management, vegetative propagation, and harvesting conditions.[1]
4. The in vitro synthesis of bioactive chemicals from *L. reticulata* will also be augmented by the use of

innovative methods like cell culture, genetic engineering, and bioreactors.[1]

REVIEW OF LITERATURE

1. Antianaphylactic Activity[11]

A Polyherbal formulation of DLH- 3041 that contains *L. Reticulata* as one of its ingredient was examined by Padmalata in relation to prednisolone and disodium chromoglycate in terms of its impact on active and passive anaphylaxis in rats using mesenteric mast cell. In animals with sensitivites, the herbal preparation (DLH-3041) demonstrated a strong defence against mast cell degranulation.[11] These effects are explained by its capacity to control acute hypersensitivity reactions by stabilising mast cells and preventing histamine release and antibody synthesis. The study is conducted on wistar rats by using animal models such as Passive Cutaneous Anaphylaxis (PCA) model, Sheep Serum-induced Passive Anaphylaxis model. The flavonoids such as quercetin and rutin are responsible for antianaphylactic activity of *L. Reticulata.*

2. Antimicrobial Activity

The antibacterial activity of *Leptadenia Reticulata* investigated by vaghasiya and chanda by using several solvent extract from *L. Reticulata* leaves aganist five gram- positive, seven gram- negative, and three fungus strains.[12] Theydiscoverd that the acetone extract had no action against any of gram- positive bacterial strains, However it was effective against two gram-negative organisms (*Klebsiella pnuemoniae, Proteus mirabilis*). The methanolic extract was effective aganist both gram-positive (*Staphylococcus aureus and S.epidermis*) and gram- negative (*Klebsiella pnuemoniae, Proteus mirabilis*). Similarly ethanolic Extract of *L. Reticulata* leaves showed significant antibacterial action against *bacillus subtilis, Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Aspergillus flavus and A. Niger* .[13]In a rat animal model, the antifungal activity of a 50% ethanolic extract of *L. reticulata's* aerial portion against A. flavus was investigated in vivo.[14] The antimicrobial activity of L. Reticulata attributed by monoterpenes, triterpenes (like lupeol), sesquiterpenes, and phenolic compounds (including gallic acid, rutin, luteolin, diosmetin, and kaempferol).

3. Anti-Tumor Activity[15]

The current study aims to determine the effect pf an ethanolic extract of *L. Reticulata* leaves (LELR) on Dalton's Ascitic lymphoma (DAL) on swiss albino mice. DAL cells (106 cells) were administerd intraperitoneally into mice. Two days following cell injection, the animal was given 200 mg/kg for LELR for eight days. Five-Fluorouracil (20 mg/kg) was emplyoed as the reference medication. On day 11, the mice's cancer cell count, packed cell vloume, tumor weight, life duration and haematology improved.[15] The ethyl acetate extract of naturally grown L. reticulata was found to be efficient in suppressing MCF-7(Michigan Cancer Foundation-7), HT-29(Human Colorectal Adenocarcinoma), and L6 cells with IC50 (half-maximal inhibitory concentration) values of 21 µg/mL, 26 µg/mL, and 22 µg/mL, in an in vitro research. Micropropagated L. reticulata's ethyl acetate extract demonstrated cytotoxicity against MCF-7, HT-29, and L6 cells, with IC50 values of 20 µg/mL, 30 µg/mL, and 18 µg/mL, respectively. Flavonids (quercetin**,** apigenin**,** and luteolin**)** and phenolic compounds **(**like ferulic acid and p-coumaric acid**),** as well as triterpenoids such a**s** β- sitosterol**,** α-amyrin**,** and β-amyrin are show antitumor activity of *L. Reticulata.*

4. Antioxidant Activity

To examine the in-vitro antioxidant activity of a methanolic extracts of *Leptadenia Reticulata* (LRM) in experimental rats through biochemical and histopathological methodologies. LRM showed strong antioxidant activity by inhibiting the DPPH (1,1- Diphenyl-2-Picrylhydrazyl) nitric oxide and hydroxyl radical. Oxidative stress in the myocardium of ADR- treated (Adriamycin-induced) rats was indicated by reduced levels of markers such as alanine transaminase, aspartate transaminase, lactate dehydrogenase and creatinine kinase in heart homogenate with elevated levels of same enzymes in serum.[16] These activity of L. Reticulata was studied on rodents. In a similar way, the DPPH free radical scavenging activity investigation demonstrated that the ethyl acetate extract of L. reticulata possessed the highest antioxidant potential, with an IC50 value of 267.13 µg/mL. The methanolic extract of L. reticulata exhibited an IC50 value of 510.15 µg/mL.[17] The antioxidant activity of *Leptadenia reticulata* is attributed to a variety of phytochemicals, particularly flavonoids and phenolic acids such as quercetin, rutin, luteolin, diosmetin, ferulic acid, p-coumaric acid, catechin, and ellagic acid**.**

5. Diuretic Activity[18]

The diuretic impact of an aqueous and ethanolic extract of the entire plant *L. Reticulata* was conducted in normal rats. Experimental rats were given 100mg/kg of aqueous and ethanolic extracts of entire *L. Reticulata* plant. Furosemide (100mg/kg) was employed as a positive control in the study. The diuretic impact of the extract was assessed by measuring urine volume, sodium, potassium, and chloride content.Both the aqueous and ethanolic extracts increased urine volume significantly as compared to the control group,but not as much as furosemide produced. There was a significant increase in renal clearance of sodium, potassium and chloride ions. The diuretic activity of *Leptadenia reticulata* is primarily attributed to its content of flavonoids and terpenoids.

6. Hepatoprotective Activity[19]

L. Reticulata shows Hepatoprotective activity by using ethanolic and aqueous extracts of stems which is performed on albino rats.Hepatotoxicity was induced using a 1.25 ml/kg dosage of the toxicant CCl4 (Carbontetrachloride) in a 1:1 combination with olive oil. For seven days, 250 and 500 mg/kg/day of ethanolic and aqueous extracts of *L. reticulata* stems were taken orally. The standard medication was silymarin (50 mg/kg).A significant reduction in the elevated levels of serum glutamic oxaloacetic transaminase, serum glutamic pyruvic transaminase, and alkaline phosphatase demonstrated the hepatoprotective effect of the ethanolic extract of *L. reticulata*.When compared to the normal and silymarin-treated groups, the animals treated with ethanolic and aqueous extracts showed a significant reduction in liver damage and its symptoms by restoring the architecture of the liver, as seen by lower levels of serum bilirubin and protein. The hepatoprotective activity of *Leptadenia reticulata* is primarily attributed to its flavonoid contents, specifically compounds such as luteolin**,** rutin, and apigenin.

7. Anti-inflammatory and Anti-pyretic Activity

To assess the anti-inflammatory activity of whole plant solvent extracts of *L. reticulata*, a formalin and λ-carrageenan-induced paw oedema model was used, followed by the measurement of pro-inflammatory cytokines (IL-2, IL-6, and TNF-α) in the serum of adult Wister albino rats. At 600 mg kg−1, the ethyl acetate extract decreased oedema by 60.59%, whereas the ethyl acetate fraction was sufficient to suppress oedema by 59.24%. When mice were given ethyl acetate extract (600 mg kg−1), their serum levels of TNF-α (Tumor Necrosis Factor-

alpha), IL2 (Interleukin-2), and IL6 (Interleukin -6) were decreased, suggesting that*L. reticulata* may have anti-inflammatory properties. Several animal models were used to test the aqueous whole plant extract of *L. reticulata's* antipyretic and anti- inflammatory properties.Studies showed that a dose of 200 mg kg−1 and 400 mg kg−1 body weight, respectively, demonstrated a substantial antipyretic and anti-inflammatory effect in all animal models. These results raised the possibility that *L. reticulata* aqueous extract could be used in the future to effectively treat pyrexia and inflammation.[20,21] The anti- inflammatory and antipyretic activities of *Leptadenia reticulata* are primarily attributed to a combination of phenolic compounds and flavonoids, including specific compounds like quercetin, rutin, and p-coumaric acid.

8. Anti-ulcer Activity[22]

The antiulcer properties of *L. reticulata's* aqueous leaf extract (100 mg kg−1 and 200 mg kg−1) were assessed in rats .The findings indicated that *L. reticulata*leaves used to treat ulcers because they showed a significant decrease in total acidity, acid volume, and ulcer index when compared to control animals. The antiulcer activity of *Leptadenia reticulata* is attributed to several phytochemicals, particularly flavonoids (such as quercetin and rutin) and phenolic compounds (specifically p-coumaric acid).

9. Antiepileptic Activity[25]

The anti-epileptic properties of *L. reticulata* methanolic extract against lithium-pilocarpine-induced status epilepticus, pentylenetetrazol (70 mg/kg, i.p.), and maximal electroshock (150 mA intensity for 0.2 s), respectively. The methanolic extract of L. reticulata was found to have a considerable effect against maximum electroshock and pentylenetetrazol, but it was not very efficient against catalepsy caused by haloperidol or status epilepticus caused by lithium pilocarpine. The powdered leaves of *L. reticulata* are used as a snuff in traditional medicine to treat epileptic episodes. Additionally, it is a component of traditional polyherbal remedies for a variety of mental illnesses and as a general tonic (Rasayana herb). This activity is carried out on Wistar albino rats and mice by using specific animal models such as seizure induction methods. The phytochemicals such as Flavonoids (e.g., luteolin, diosmetin, rutin, apigenin, quercetin), Triterpenoids (e.g., α-amyrin, β-amyrin, lupeol, simiarenol, α- amyrin acetate), Steroids (e.g., β-sitosterol, stigmasterol), Phenolic acids (e.g., ferulic acid, p-coumaric acid), Pregnane glycosides (e.g., reticulin, deniculatin, leptaculatin).

❖ **Phytochemical Evaluation**

Table No. 1: Phytochemical analysis of *L. Reticulata* leaf, stem, and fruit.[23]

Sr. No.	Phytochemical	Test	Results		
			Leaf	Stem	Fruit
1.	Alkaloids	Mayer's Test	-	+	+
2.	Phenols	Ferric Chloride (Fecl3)Test	-	-	-
3.	Flavonoids	Alkaline Reagent	+++	+	-
4.	Saponins	Frothing Test	-	-	-
5.	Tannins	Ferric Chloride(Fecl3) Test	++	-	-
6.	Phlobatanins	Hydrochloride Acid (HCL)Test	-	-	-
7.	Steroids	Liebermann-Burchard Test	+++	-	-
8.	Glycosides	Killer-Kiliani Test	+	++	++
9.	Anthocyanins	Ferric Chloride(Fecl3) Test	-	-	-
10.	Triterpenes	Hydrochloride Acid (HCL) Test	-	++	+++
11.	Quinines	Hydrochloride Acid (HCL) Test	-	+	+
12.	Leuco-anthocyanins	Alcohol Test	-	-	-
13.	Coumarins	Sodium Hydroxide (NaOH) Test	+	-	-

CONCLUSION

The pharmaceutical industry's indiscriminate exploitation of this species for medical purposes and its limited distribution are causing its natural strand to disappear. The International Union for Conservation of Nature and Natural Resources has consequently declared it as an endangered species. This review gives the scientific information currently known on *L. reticulata's* botanical, phytochemical, biological, pharmacological, and other unidentified characteristics. Today's therapeutic practices can use this multipurpose medicinal herb to treat a variety of human problems because it has multiple promising medicinal properties. With its lactogenic, revitalising, and rejuvenating properties, *L. reticulata* can be the primary ingredient in a variety of herbal preparations. Several groups of bioactive chemicals are present in this herb. Additionally, the use of biotechnological tools including cell culture, molecular markers, and micropropagation is emphasised in order to validate in future applications. The potential molecular mechanisms of action of each pure product of *L. reticulata* should be carefully evaluated and understood by means of additional in vitro and in vivo investigations. To make sure that this medicinal plant is safe for human use, more toxicity research and clinical trials need to be supported. All things considered, this review highlights the medicinal potential of *L. Reticulata*.

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