



REVIEW ARTICLE

PHARMACOGNOSTIC, PHYTOCHEMICAL AND PHARMACOLOGICAL REVIEW OF *DENDROPHTHOE FALCATA*

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SUMMARY

Nature is blessed with variety of plants having medicinal properties one of which is *Dendrophthoe falcata* widely distributed in India. *D. falcata* is a hemiparasitic plant having almost 401 plant hosts of which Sugar apple (*Annona squamosa*), and epicortical roots as on Sapota (*Achras zapota*), guava (*Psidium guajava*), pomegranate (*Punica granatum*), mango (*Mangifera indica*) are commonly known. It is indigenously said to have potential medicinal properties. It is reported to have diuretic, wound healing, anti microbial, antihelminthic, anti fertility, anti oxidant, anti cancer, anti diabetic, anti hyperlipidemic, anti hypertensive activities. This paper presents a limited review on the pharmacognostic, phytochemical and pharmacological activities of *D. falcata*.

Key words: *Dendrophthoe falcata*, Hemiparasitic

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1. Introduction

Dendrophthoe falcata is also known as "Vanda" in the Indian Ayurvedic System of Medicine. *Dendrophthoe falcata* (L. f.) ettingsh is a perennial climbing woody parasitic plant. It is indigenous to tropical regions especially in India, Srilanka, Thailand, China, Australia, Bangladesh, Malaysia and Myanmar. It is widely distributed throughout in India¹. It is a hemi parasitic plant whose whole plant is used in indigenous system of medicine as a potential medicinal agent like cooling, bitter, astringent, aphrodisiac, narcotic and diuretic, and is useful in pulmonary tuberculosis, asthma, menstrual disorders, swelling

wounds, ulcers, renal and vesical calculi and vitiated conditions of kapha and pitta. Also decoction of plant is used by women as an antifertility agent, also have anticancer activity^{2,7}. Leaf paste is used in skin diseases. Its paste is applied on boils, setting dislocated bones and extracting pus. The plant has been scientifically proved to have antilithiatic, diuretic, cytotoxic and immunomodulatory activities^{3,4,5,6}. A large, bushy, evergreen, parasitic plant with smooth grey bark; young parts glabrous or nearly so.

Kingdom	: Plantae
Order	: Santalales
Family	: Loranthaceae
Genus	: Dendrophthoe
Species	: <i>D. falcata</i>

Taxonomical classification⁸

Dendrophthoe falcata on host, *Annona squamosa*



Synonyms⁸: *Loranthus amplexifolius* Desr.,
Loranthus bicolor Roxb., *Loranthus falcatus* L.f.,
Loranthus longiflorus Desr

Sanskrit : Vrksadani, Bandaka, Vrksaruha,
Samharsa

Bengali : Maandaa

English : Mistletoe

Gujrati : Baando

Hindi : Bandaa

Kannada : Bandanike, Bandhulu

Malayalam : Ittikanni, Itil

Marathi : Baandagul, Banda

Oriya : Vrudhongo

Punjabi : Pulluri

Tamil : Baadanikaa, Jiddu

Telugu : Jeevakamu

2. Description⁸:

a) Macroscopy

Leaves: Petiolate, exstipulate, opposite, decussate, simple, ovate to oblanceolate, glabrous, soft and leathery when young, brittle when dry; margin entire; base decurrent; apex acute; slightly astringent; odour resembling those of tea leaves.

Stem: Small twigs of aerial branches ranging from 2 mm to 2.5 cm in thickness; the bark of stem thin, dark brown and specked with lighter brown, uniformly distributed lenticles; the wood reddish-brown after removal of thin bark; stem slightly rough to touch; fracture irregular; fractured surface dark brown; no distinct taste or odour.

Root: Adventitious root greyish brown outside, yellowish to brown inside, slender, contorted and knotty in appearance, sending out haustoria into the host plant or, also into

its own branches; rarely branched; fracture, irregular; odour and taste not distinct.

Flowers: Actinomorphic, bisexual, regular, complete, coloured, apetalous, epigynous with cup or disc shaped receptacle, pentamerous; perianth-tepals 5, free and strap shaped towards the distal end and in the form of a sickle-shaped tube towards the basal end; surrounded at the base by a cup-shaped calyx; the perianth tube measures about 40 to 55 mm in length; it is narrow at the base and gradually widens towards the upper part; the perianth lobes become strongly reflexed at maturity. Inside the perianth tube are 5 cushion shaped nectarines; androecium stamens 5, epiphyllous, starting from two-thirds of length of perianth tube and continuing to the tip of perianth lobes, appressed to the style in young flowers; filaments orange coloured; anthers monotheous, dark, basifixed; gynoecium ovary 1, inferior, obscurely unilocular; style long, filamentous; stigma capitate; placentation basal, one ovule in each locule.

Fruit: The fruit is an ovate pseudo berry, upto 3 mm in thickness and 3 to 8 mm in length; greenish-yellow when mature and turning brown when dry; the top of the fruit is crowned by a persistent calyculus; the fruit contains an elongated, flask-shaped seed upto 5 mm long and 2 mm thick, brown, hard, and enclosed in a shiny, viscid film.

b) Microscopy

Leaves: Transverse section of the leaf shows a thick cuticle, upper and lower epidermis composed of squarish cells with convex

periclinal outer walls; surface views of upper and lower nearly similar; stomata paracytic, present on both surfaces; mesophyll of lamina consisting of 2 to 4 layers inner to upper and lower epidermis made up of compactly arranged short rectangular cells and irregularly arranged parenchyma cells of middle layers but possessing a few intercellular spaces; occasional vascular strands passing through this middle portion; isolated sclereids about 50 μ thick containing prismatic crystals of about 12 μ present in parenchyma; midrib bulging prominently on both the surfaces and containing a group of 3 to 5 vascular bundles; xylem of vascular bundles oriented towards upper epidermis and consisting of tracheids, vessels and parenchyma; phloem present towards lower epidermis and consisting of thin walled cells; bundle sheath absent; each vascular bundle associated with patch of collenchymatous

cells outside the phloem; tannin (ranging from yellow to brown in colour) abundant in parenchyma cells of midrib and lamina region, especially in the 2 or 3 subepidermal layers; stomatal index 9 to 13 on upper surface and 10 to 14 on lower surface.

Transverse section of leaf¹⁷



ep-epidermis,pl-palisade,ph-phloem,ms-mesophyll,xy-xylem,ch-cholemychma, sc- stone cells

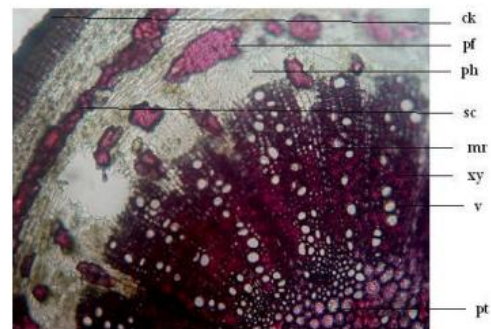
Leaf constants of *D. falcata*¹⁷

Parameters	Value
Stomatal number	
Upper epidermis	100
Lower epidermis	150
Stomatal index	
Upper epidermis	13.1
Lower epidermis	14.5
Vein islet number	2-4
Vein termination number	5-6

Stem: A transverse section of stem reveals a circular outline with a thick cuticle, and epidermis made up of squarish or barrel shaped cells with convex outer periclinal walls and interrupted here and there by lenticular openings; cork made up of thin-walled, crushed rectangular cells; cortex consisting of many layers of tangentially elongated and rounded cells interspersed with sclereids upto 85 μ in size and in groups of 2 to 4; many cells of cortex, especially those of outer few layers contain tannins ranging in colour from yellow, orange to dark brown; groups of pericyclic fibres form a ring outside phloem; cambium present; xylem surrounding the central pith and composed of well developed vessels, fibre and parenchyma, 1 to 4 seriate medullary rays composed of radially elongated cells present; pith consists of thin walled, rounded or polygonal parenchymatous cells; small groups of sclereids, up to 85 μ each in size

present in both pith and medullary rays; prismatic crystals present in association with sclereids and medullary ray cells.

Transverse section of stem¹⁷



ck-cork,pf-pericyclic fibers,ph-phloem,sc-stone cells,mr-medullary rays,xyxylem,v-vessels,pt-piths

Root: A transverse section of adventitious root is circular in outline; cuticle and epidermis sloughed off; outermost zone

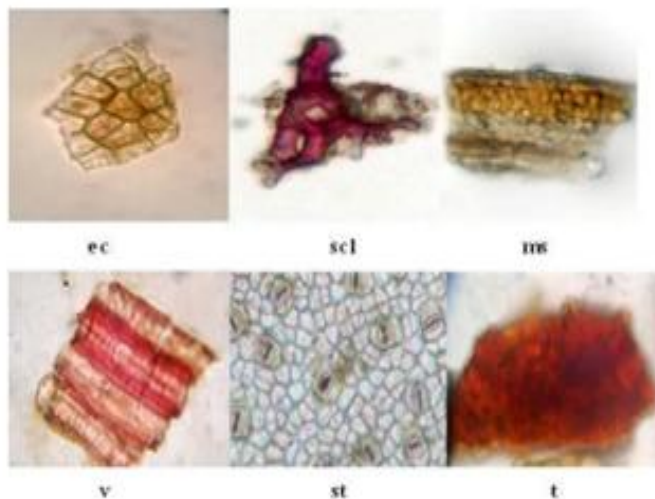
consists of broken tissue of cork and cortex followed by cork cambium made of rectangular cells; cortex wide, many layered, made of thin walled rounded cells and sclereids upto 50 μ size, present singly or in groups of 2 to 4; many cells of cortex contain tannin; patches of pericyclic fibres surround the vascular ring; phloem composed of small thin walled cells present outside the xylem and separated from it by the vascular cambium; xylem interrupted by short, 1 or 2 seriate medullary rays composed of radially elongated cells; xylem composed of scattered vessels, parenchyma and fibres; pith wide, composed of rounded parenchymatous cells interspersed with thick walled fibres of about 5 μ in dia.

Fruit: T.S. of the pseudoberry shows the outer tissues of thalamus separated by a zone of viscid mass from the inner tissues of the seed. Fruit tissue consist of an outer epicarp formed of a single layer of epidermis composed of squarish or rounded, thickly cuticularized cells followed by 3 or 4 layers of thick walled, larged sized, squarish cells

containing tannins; mesocarp consist of multiple layers of small relatively clear cells with interspersed groups of stone cells. Fruit wall delimited inside by multiple layers of large, rounded, thin walled parenchymatous cells containing yellow to dark brown tannins; the seed consists of an outer viscid zone delimited towards inside by a ring of tissues made of several layers of isodiametric cells mostly containing brown pigment in outer 2 or 3 layers and a ring of vascular bundles. Inner to this is a zone comprising of radially elongated, compactly arranged thin-walled cells rich in starch towards the center; centre of the seed occupied by a mass of uniform, isodiametric, parenchymatous embryonic cells.

Microscopy of the powder

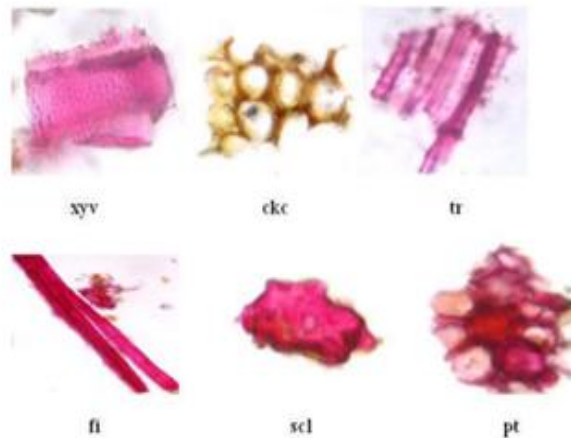
Leaves: The powder shows angular epidermal cells and groups of thin walled, rectangular, closely packed parenchyma cells many of which contain tannins⁸, paracytic stomata, lignified stone cells, vessels, prismatic calcium oxalate crystals¹⁷.



ep-epidermal cells,scl-sclereids,ms-mesophyll,v-vessels,st-stomata,t-tannin

Stem: Powder shows vessel elements with simple pitted thickenings, groups of sclereids containing prismatic crystals (size of crystal

30 to 35 μ long and 15 to 17 μ wide) and fragments of parenchyma cells containing tannins^{8,17}.



xyv-xylem vessels,ckc-cork cells,tr-tracheids,fi-fibre,scl-sclereids,pt-pith

Root: Powder shows tracheids and vessel members with simple pitted thickenings, broken fibres; stone cells with faint incomplete radial striations, upto 50 µ in size and containing prismatic crystals⁸.

centre at distal end of each arm, and endothelial tissue⁸.

Fruit: Cellular debris and stone cells with circular striations 20 to 35 µ are seen, groups of cells containing tannins also present⁸.

Flower: The powder shows characteristically triradiate, smooth walled, pollen grains upto 45 µ in size and having a depression in the

Physico chemical constants⁸

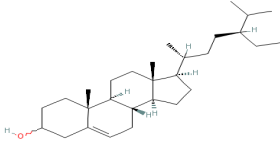
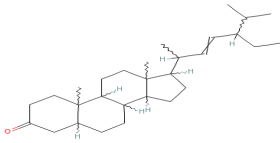
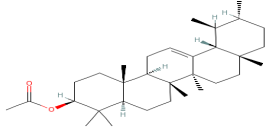
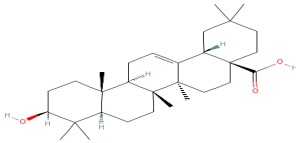
S. No.	Physico chemical constant	Leaf	Stem	Root	Flower	Fruit
1	Foreign matter	NMT 1%	NMT 1%	NMT 1%	NMT 1%	NMT 1%
2	Total ash	NMT 14%	NMT 5%	NMT 6%	NMT 8%	NMT 8%
3	Acid insoluble ash	NMT 4%	NMT 1%	NMT 1%	NMT 1%	NMT 1%
4	Alcohol soluble extractive	NMT 3%	NMT 3%	NMT 12%	NMT 20%	NMT 17%
5	Water soluble extractive	NMT 3%	NMT 3%	NMT 1%	NMT 4%	NMT 5%

Constituents⁸

Leaves⁹: Leaves contain flavonoids such as Quercetin, quercetrin;Tannins comprising of gallic and chebulinic acid.

Stem: Young shoots contain nearly 10 per cent tannins and the stem contains β-amyrin-0-acetate, oleonolic acid its methyl ester acetate,β-sitosterol and stigmasterol.

Root: Catechin and leucocynidin in the bark.

Name	IUPAC Name	Formula	Structure
beta-Sitosterol	17-(5-ethyl-6-methyl-heptan-2-yl)-10,13-dimethyl-2,3,4,7,8,9,11,12,14,15,16,17-dodecahydro-1H-cyclopenta[a]phenanthren-3-ol	C ₂₉ H ₅₀ O	
Stigmasterol	17-(4-ethyl-1,5-dimethyl-hex-2-enyl)-10,13-dimethyl-2,4,5,6,7,8,9,10,11,12,13,14,15,16,17-hexadecahydrocyclopenta[a]phenanthren-3-one	C ₂₉ H ₄₈ O	
beta-Amyrin acetate	(4,4,6a,6b,8a,11,12,14b-octamethyl-2,3,4a,5,6,7,8,9,10,11,12,12a,14,14a-tetradecahydro-1H-picen-3-yl) acetate	C ₃₂ H ₅₂ O ₂	
Oleanolic acid	10-hydroxy-2,2,6a,6b,9,9,12a-heptamethyl-1,3,4,5,6,6a,7,8,8a,10,11,12,13,14b-tetradecahydronicene-4a-carboxylic acid	C ₃₀ H ₄₈ O ₃	

Pharmacology studies

Wound healing activity: Traditionally, fresh leaf and stem are ground into a paste with water and applied topically on affected places to heal wounds¹⁰. The ethanolic extract of the aerial parts showed potent wound healing activity¹¹. Ethanolic extract of aerial parts was investigated for the evaluation of its healing efficiency on excision and incision wound models in rats. The results showed that *Dendrophthoe falcata* extract has potent wound healing capacity as evident from the wound contraction and increased tensile strength¹².

Antimicrobial activity: petroleum ether, chloroform and ethanolic extracts exhibits significant antimicrobial activity against the organisms: *Staphylococcus aureus*, *Staphylococcus pyogenes*, *Staphylococcus epidermidis*, *Micrococcus luteus*, *Bacillus*

subtilis, *Bacillus cereus*, *Klebsiella pneumoniae*, *Enterobacter aerogenes*, *Pseudomonas aeruginosa*, *Serratia marcescens*, and five fungi *Candida albicans*, *Candida tropicalis*: dimorphic fungi, *Aspergillus fumigatus*, *Aspergillus niger*: systemic fungi, and some infectious bacteria *Escherichia coli*, and *Salmonella typhi*¹¹.

Anthelmintic activity: Ethyl acetate and methanolic extracts of the *D. falcata* leaves showed significant activity at 40 mg/ml¹³.

Anti fertility effect: The effect of traditionally used antifertility plant, *Dendrophthoe falcata* (L.f.) Ettingsh (Loranthaceae), was studied on female reproductive system, fertility and safety, by oral administration to adult female Wistar rats. The study revealed that the hydroalcoholic extract of the aerial parts has

antifertility effect and is safe at effective doses employed in the study. The LD(50) value was found to be 4.55 g/kg body weight¹⁴.

Contraceptive effect: The methanolic extract of stem of *Dendrophthoe falcata* Ettingsh (family-Loranthaceae), was gavaged in male albino rats (Adult proven fertile male rats) at 50, 100 and 200 mg/rat/day for 60 days. The activity was compared with standard drug, i.e. Lonidamine. The study revealed that the sperm motility and density were significantly reduced. The histoarchitecture of testes revealed degenerative changes in the seminiferous tubules, arrest of spermatogenesis at the stage of round spermatid. Serum testosterone levels were decreased significantly in all treatment groups. It is concluded that *D. falcata* methanol stem extract showed a significant effect on fertility in male rats as reported in folk remedies¹⁵.

Antioxidant and anticancer activity: The therapeutic potential of the hydroalcoholic extract of *Dendrophthoe falcata* (L.f) Ettingsh (Loranthaceae; HEDF) on 7,12-dimethylbenz(a)anthracene (DMBA)-induced mammary carcinoma was investigated in Wistar female rats. The study revealed that a significant decrease in alanine aminotransferase, aspartate aminotransferase with a sharp increase in alkaline phosphatase, acid phosphatase, and 5'-nucleotidase was observed in the liver of mammary cancer-bearing animals. HEDF treatment caused the activity of these liver marker enzymes' return to almost normal control levels. Furthermore, the breast tumor weight decreased significantly in the DMBA + HEDF-treated groups. This result suggests that HEDF shows antioxidant activity and play a protective role against DMBA-induced breast carcinogenesis¹⁶.

Antihyperlipidaemic Activity:

Hyperlipidaemia was induced by administration of High fat diet (HFD for 42 days which showed marked elevated levels of serum TC, TG, LDL VLDL, and reduction in level of HDL as compared to control

group fed with normal diet. Administration of *Dendrophthoe falcata* leaves ethanolic extracts with daily dose of 300 mg/kg, p.o significantly altered the levels of serum TC, TG, LDL, VLDL and serum HDL level at different degrees. Ethanolic extract (70%) at 300mg/kg showed significant ($p < 0.01$) antihyperlipidaemic activity in HFD induced hyperlipidaemia¹⁸.

Antidiabetic Activity: Diabetes was induced with alloxan in rats at 70mg/kg dose. It was observed that the ethanolic extract (70%) of the *D. falcata* leaves at 300mg/kg had significant ($p < 0.01$) reduction in elevated blood glucose level as compared with diabetic control group¹⁸. It is also reported to have antihypertensive activity¹⁹, diuretic and antilithiatic activity²⁰.

Formulation studies

As a tablet binder: Tablets were prepared with *D. falcata* mucilage and evaluated for tablet characteristics. Wet granulation technique was used for the preparation paracetamol granules. The tablet binder concentrations used in formulations were 2, 4, 6 & 8 % w/w. Tablets were compressed to hardness at about 6.6 to 6.9 kg/cm². The evaluation of tablet showed 0.98 to 0.53 % friability, 10 to 17 min disintegration time and more than 90 % dissolution in 70 min. Tablets at 6 % w/w binder concentration showed more optimum results as tablet binder. The *Dendrophthoe falcata* mucilage was found to be useful for preparation of uncoated tablet dosage form²¹.

3. Conclusion

It may be concluded that *D. falcata* is a potential medicinal plant widely available in India. The pharmacological and formulation studies which are summarized in this review may help the researchers to focus on clinical studies and further formulation studies which may be beneficial to the humans.

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