Review Article

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# Terminalia Arjuna Wight & Arn (Arjuna)

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Abstract:

Terminalia arjuna Wight & Arn (Arjuna) ,family Combretacecae , a large deciduous tree commonly found through out country is widely used in folks and Ayurvedic system of medicine. Its stem bark and leaves contains glycosides, flavones, tannins and large amount of Calcium salts. Various properties of T. arjuna, described in folks and Ayurveda like Hridrognasak, Kapha-medo vishoshan, Vrana ropak, Bhagn sandhankar, Pramehghan, Stambhak, Kantida, Rakt-pittahar, Balya etc. are acquiring scientific validity through modern researches. Scientific studies shows that its bark containing ionotropic , hypotensive effect, increasing coronary artery flow, hypolipidemic ,anti-diabetic, anti-oxidant, anti-inflammatory, anti-fungal, anti-diarrhoeal, wound heeling and osteoblastic properties. In this review an attempt has been made to discuss various aspects of Arjuna like ethnobotanical, pharmacognostical, phytochemical, pharmacological and its clinical relevance in various ailments.

Keywords: Ayurveda, Terminalia arjuna , glycosides , ethnobotany, pharmacognosy, therapeutics.

## Introduction

*Terminalia arjuna Wight & Arn* is a wide spread medicinal plant used in *Ayurvedic* system of medicine to cure various ailments and is one of the active ingredient in numerous polyherbal hepatoprotective formulations. Its stem bark and leaves contain glycosides, large quantites of flavonides, tannin and minerals. Flavonides have been detected to exert antioxidant, anti-inflammatory and lipid lowering effects whereas glycosides are cardiotonic, therefore making *Terminalia arjuna Wight & Arn* distinctive amongst currently used medicinal plants.

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### *History*

Term *Arjuna* was used for the first time in the *Rigveda*.[1] Several medicinal Plants have been described to be beneficial for cardiac ailments in *Atharvaveda*, the oldest manual on treatise from which *Ayurveda*, the Indian system of medicine is said to owe its origin. Quite a few of them, for example are *Allium sativum* L. (*garlic*), *Cicer arietinum* L. (*Bengal gram*), *Commiphora mukul* (*guggulu*), *Ocimum sanctum* L. (*tulsi*).[2,3] In *Atharvaveda dwitiya kand Arjuna* has been quoted at 5 places. *Terminalia arjuna Wight & Arn* (*arjuna*) has been identified and researched for its putative lipid lowering and cardio-protective activities.[4]

### *Arjuna in Ayurveda*

*Arjuna* has been extensively used in therapeutics in *Ayurveda*. A short overview of *Arjuna* is being reproduced here.

*i.* *Charak Samhita*: *Kashay skandha*[5], *Udardprashmana Mahakashay*.[6]

*ii.* *Sushruta Samhita*: *Nyagrodhadi*[7] and *Salasaradi gana*.[8]

*iii.* Ashtanga Hridaya: *Nyagrodhadi* [9], *Asnadi gana.*[10]

*iv. Bhavaprakash Nighantu*: *Vatadi varge.*[11]

*v. Dhanvantari nighantu: Amradi varge.*[12]

*vi. Raj nighantu*: *Prabhadradi varge.*[13]

*vii. Kaiyadev nighantu*: *Aushadhi gana.*[14]

*Classical Names*

*Kakubh, Nadisarja, Indradu, Veervriksha, Veerasch,11 Partha, Dhananjay, Savyasachi, Shamber*[13]

*Pharmacological Properties (Ayurveda)*

*Rasa- Kashay; Guna-laghu, ruksha; Virya-sita; Vipaka-katu; Doshghanta-kaphapittashamak.* [13]

*Taxonomic Classification*

*Kingdom:* Plantae

*Division:* Magnoliopsida

*Class:* Magnoliopsida

*Order:* Myrtales

*Family:* Combretaceae

*Genus: Terminalia*

*Species: arjuna*

*Botanical Name*: *Terminalia arjuna Wight & Arn (Roxb).*

*Botinical Description*

A large, evergreen tree, stem bark externally flesh coloured, internally smooth, flaky, bitter in taste. The young stem shows typical combretaceus type of hair, having swollen base, and tapering apex. Leaves opposite or sub-opposite, short petioled with two glands on the midrib beneath near the base, dorsi-ventral oblong or elliptic, coriaceous, cordate, shortly acute or obtuse at the apex, flowers in panicled spikes. Fruit ovoid or ovoid oblong, 2.5-5.0 cm long , nearly glabrous, with 5-7 hard, winged angles. Seeds are composed of stone cells, fibres and vascular supply.

*Phytochemistry*

The bark contains the flavones, arjunolone, terpenes, and their glycosides, arjungenin, friedelin, arjunin, arjunectine, arjun, glycoside I, II, III, arjunoside II, arjunolic acid, oleanolic acid, and arjunic acid, in addition ellagic acid, gallocatechol, pyrocatechol, tannins(19%),β – sitosterol, arjunolic acid, diglycoside (arjunolitin) and large amount of calcium salts has also been isolated from bark.[15]

*Therapeutic Properties*

Experiments conducted with bark of *Arjuna* have shown hypolipidemic, hypocholesterolemic, anti-diabetic and anti-inflammatory activities.[16] In addition the thick, white to pinkish-grey bark has been shown to possess anti-cancerous, anti-ulcer, antimutagenic and wound healing activities.[17] Some of the important therapeutic activities of *Arjuna* are being reviewed here.

*I. Heart Disease*

Arjun has been indicated for the treatment of various cardiac ailments in Ayurveda classics. In cardiac disorders milk processed with *arjuna* bark should be used.[18] Those who take *arjuna* bark with ghee, milk, or *jaggery* water are relieved of heart disease, chronic fever, intrinsic haemrrhage and attain *longevity.*[19] One who takes powder of wheat and *arjuna* bark cooked with oil, ghee, and *jaggery* with milk overcomes all cardiac disorders.[20] *Arjuna* bark in one of the constituent of *Udumberadi leha* indicated for the treatment of *kaphaj hridroga.*[21,22] Malamasar tribe of Parambiculam wild life sanctuary Kerla use *T. arjuna bark for the treatment of cardiac disease.*[23] In Uttaranchal, stem bark of *T. arjuna* with honey is reported to be used for the treatment of heart diseases.[24] In some parts of Bangladesh stem bark is being used for the treatment of fractured bone and heart diseases.[25]

*Preclinical Studies*

Effect of bark extract of *T. arjuna Wight & Arn* (6.75mg/kg of body wt) on caffine (10mg/kg body wt.) induced CHD on male wistar rats (120-160g) was studied. Treatment of rats with *T. arjuna Wight & Arn* resulted in an increase in HDL cholesterol, decrease in total serum cholesterol, triglyceride, LDL, VLDL cholesterol. Findings suggest that bark extract of *T. arjuna Wight & Arn* has protective effect against caffine induced CHD and may have potential as a cardioprotective agent.[26]

*Clinical Studies*

A clinical trial was conducted on 51 patients of coronary heart disease, with 2 capsule of 500 mg each containing *Arjun* bark powder in morning after breakfast and in evening with milk. The patients were advised to walk in fresh air, with gradual increment in distance with permission of Yogic exercise. This treatment was continued for 4 months and followed up each month. Reduction in systolic, diastolic B.P., serum cholesterol, LDL was noticed. On the basis of available experimental evidences, the drug is considered as cardioprotective, its anti-anginal properties along with its potentials of modifying various coronary risk factors.[27]

*II. Hypolipidemic Action*

*Acharya Sushruta* has classified *Arjuna* in *Salsaradigana,* which have *kaphamedovishoshan* property and used as *kaphamedohar* in various nighantus. [11,12,13,14]

*Preclinical Studies*

The hypolipidemic activity of 50 % ethanol extract of bark of *Terminalia arjuna Wight & Arn* (at a dose of 40mg/kg) were evaluated in rats, showing reduction in plasma total cholesterol, triglycerides, LDL cholesterol while HDL cholesterol increased in experimental group in comparison with hypercholesterolemic animal group. Atherogenic index and liver weight of treated animals also showed significant decrease. It seems to be mediated through increased hepatic clearance of cholesterol, down regulation of lipogenic enzymes and inhibition of HMG- coA reductase.[28]

*Combined Clinical Study*

A clinical study on 108 patients, with Arjuna bark powder (5 gm BD) for 3 weeks, and then Arogyavardhini vati (500mg,BD) for 4 weeks were prescribed. The primary efficacy endpoint was reduction in serum total cholesterol, triglycerides, LDL cholesterol and increased HDL cholesterol levels. Secondary endpoints included reduction in C- reactive protein (CRP) and blood glucose levels. Safety assessment included hepatic function, renal function test showing no significant change. Result shows Arjuna bark powder and Arogyavardhini vati is safe and effective against dyslipidemia.[29]

*III. Wound Healing Potential*

Externally leaves of *kadamb, arjun, nimb, patali, pippala* and *arka* are useful for covering ulcers and sores.[30] *Acharya Sushurta* has used *arjuna* bark in regression of wound margins as well as ingredient of *vrana-ropan tail.*[31,32] *Laghu Vagbhat* has used *arjun* along with *kshiri vriksha* for method of *patradan* (covering wound margins) and for wound purification by *Nigantu ratnakar.*

*Preclinical Studies*

The effect of topical application of phyto-constituents (fraction I, II and III) fractionated from hydro alcohol extract of the bark of *T. arjuna* was assessed on the healing of rat dermal wounds using in-vivo models. The results indicated a statistically significant increase in the tensile strength of the incision wound and the percent epithelialization of excision wounds compared with control. Fraction I of hydro-alcohol extract of *Arjuna* bark possessed antimicrobial activity against tested microorganisms such as Pseudomonas aeruginosa, Escherichia coli, Staphylococcus

aureus, Streptophylococcus pyogenes but not Candida albicans. These results strongly suggests beneficial effects of fraction I, consisting mainly of tannins of *T. arjuna,* in the acceleration of the healing process as well as corroborating the astringent effect of tannins by drawing the tissues closure together.[33]

The effect of 50% ethanolic extract of the bark of *T. arjuna* and tannins isolated from the bark studied for wound healing activity in incision and excision wound models, after oral or topical application in form of the hydrogel. The findings revealed a statistically significant increase in the tensile strength of the incision wounds and increase in the percent reduction in wound size of excision wounds as compared to control. However the topical treatment with tannins was found to be superior in both incision and excision wounds studied. The estimated increase in hydroxyproline content of the granulation tissues of the excision wounds indicated rapid healing of wounds.[34] The wound healing activity of two herbal formulations (Himax ointment and lotion) containing Indradaru extract, i.e. *Arjuna* bark (*Terminalia arjuna Wight & Arn*) exhibited significant wound healing activity in excision and incision wound models.[35]

*IV. Treatment of Veneral Diseases*

*Achraya Sushuta* has recommended use of decoction of *Arjuna* bark with white sandle wood in the treatment of spermatorrhoea.[36] *Harita* recommended its decoction in gonorrhea.[37] *Some tribal communities of Chitrakoot, M.P* use paste of tender leaves of *arjuna (kahua)* with sugar and milk once a day for 20 days for treatment of spermatorrhoea.[38]

The chemical constituent luteolin isolated from stem bark of *T. arjuna Wight & Arn* has exhibited antibacterial activity against Neisseria gonorrhea.[39]

*V. Antioxidant and Antidiabetic Property*

*T. arjuna Wight & Arn* bark extract has antioxidant activity, protective action on lipid peroxidation, glucose lowering activity, that is observed in ethanolic extract (250 and 500 mg/ kg body weight) of *T. arjuna Wight & Arn* in alloxan induced diabetic rats. Glucose lowering activity of *T. arjuna Wight & Arn* is due to stimulation of β-cells of pancreatic island and it may alter renal and hepatic protection against oxidative damage by diabetes.[40,41]

*VI. Promotes Union of Bones*

According to *Vrinda Madhav,* one affected with fractures should take *arjuna* bark or wheat powder with milk added with ghee.[42] *T.arjuna Wight & Arn* is one of the ingrediants of an *Ayurvedic* drug *Laksha guggulu* (powder of arjuna bark and laksha is mixed with guggulu and pounded with ghee) used for treating fractures, diet of patient being milk and ghee.[43] With milk, treacle or water *T.arjuna Wight & Arn* is given in fractures and contusion with extensive ecchymosis as it promotes union of fractures.[44]

*Preclinical Studies*

A study was undertaken to evaluate the effect of ethanolic extract of *T. arjuna Wight & Arn* Linn (AT) orally at a dose of 500mg/kg on the healing process of experimentally fractured tibia of albino rats. AT treated animals' revealed faster healing process than the control animals on radiological examination. Healing was almost complete within 4 weeks of fracture in treated animals and remained incomplete in the control animals. The observed effect could be due to presence of tannins, saponins, and triterpenoid contents in *T. arjuna* which have definite action on bone regeneration and calcium, phosphorus, and alkaline phosphatase metabolism, which also plays an important role in osteoblastic activity.[45,46,47]

*VII. Skin Disease*

*Achraya Charak* has used *Arjun* in treatment of skin diseases as lepa along with *manahshila, cardamon , lodhra, kashis* and has classified it

in *Udardprashman mahakashay* (antiurticarials).[6] *Laghu Vagbhat* has used lepa of *Arjuna* bark with milk in treatment of *Vyang* (hyperpigmentation of skin).[48] In frackles the paste of *Arjuna* bark or *Manjistha (Rubia cordifolia Linn)* mixed with honey should be applied.[49,50,51] *Nighantu ratnakar* has accepted *arjuna* as *kantida* (complextion promoter).

Some tribals of Bankura district, West Bengal, India use Terminalia arjuna Wight & Arn (Roxb) bark in pasty form externally in different skin diseases, against herpes and leucoderma.[52] Aquous extract of leaves exhibit strong antifungal activity against human ringworm causing fungi.[53]

*VIII. Anti Diarrhoeal Properties*

*Arjuna* used as *khad yush* in treatment of diarrhea associated with tuberculosis.[54] *Achraya Sushurta* also used *Arjuna* bark in treatment of diarrhea along with *jambu (Syzygium cumini Linn Skeel), amra (Mangifera indica), shallki (Boswellia serrata Roxb.),* and *vetas (Salix caprea Linn.)*.[55] In diarrhea associated with blood, *arjuna* bark mixed with honey should be taken with milk as it checks haemorrhage.[56] Some tribals use *T. arjuna* in treatment of dysentery.[57]

*IX. Treatment of Consumption (Tuberculosis)*

Powdered *Arjuna* bark, soaked and dried 7 times in leaf juice of vasa (*Adhatoda vasika Nees)* is administered as a linctus well mixed with honey, sugar candy and cow's ghee in case of phthisis. It stops blood in sputum and cure the sores.[58,59,60] *Arjuna bark, nagabala (Grewia hirsute Vahl.)* and *kapikacchu (Mucuna prurita Hook)* seeds are powdered together and taken after mixing with honey, ghee, and sugar followed by intake of milk. It alleviates consumption, cough.[61,62]

*X. Piles*

Decoction of *vasa (Adhatoda vasica Nees), arjuna(T.arjuna), yavasa (Alhagi camelorum Fisch),* and *nimb (Azadirachta indica A. Juss)* should be used for irrigating haemrrhoids.[63]

## Conclusion

*T. arjuna* is an important plant having potential of being used in therapeutics which is evident from classical references and present day scientific scrutiny. It bears all the basic properties of a drug described by Acharya Charaka [64] and has proved to be an important source of therapeutic agents for some trouble some diseases like atherosclerosis and ischaemic heart disease. Its wide spread classical therapeutic indications require more intensive studies.

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