

An Overview on Renowned Traditional Ancient Plant: *Terminalia arjuna*

Jaswinder Kaur¹, Dileep S. Baghel^{1*}, Saurabh S. Baghel

ABSTRACT

There are many systems of medicine in the world and *Ayurveda* is one among them. This is one of the most ancient traditional system of medicine that are practiced in India. It deals with the health of the person and cures diseases. The main objective of this review was to explore knowledge regarding *Arjuna*. Now peoples are very protective towards their health, so they all wanted to use herbal plants, remedies, etc. to cure diseases and maintain their healthy lifestyle. Due to this, *Ayurveda* markets grows very rapidly and *Ayurvedic* products are in great demand. *Arjuna* is one of them. Botanically this plant is *Terminalia arjuna* (family-Combretaceae). Traditionally this plant is used in the treatment of cardiovascular disease (*hritya roga*). Classically this plant is known by various names i.e. *Arjuna*, *Dhavala*, *Veevriksha*, *Partha* etc. This plant is found throughout India and grows upto the height of 20 to 25m. *Arjuna* grows commonly in the banks of rivers, that's why one of the synonyms is *nadisarja*. Major chemical constituents arjuna are hydrolysable tannins, triterpenoids acid, cardiac glycosides, flavonoids, phenolics, phytosterol, arjunolic acid, etc.

Keywords: *Ayurveda*, Health, *Terminalia arjuna*, Traditional.

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INTRODUCTION

Medicinal plants play a very important role in the treatment of various diseases. The term medicinal plants include several types of plants. Peoples consume plants for medicinal and dietary purposes also. Now a day's medicinal plants are used in nutraceuticals, multivitamins, and herbal tea also.^[1] Herbal plants also function as a very good immunity booster. Due to the existence of 16 distinct agro-climatic areas, India's diversity is unrivaled. India ranks 10th among the plant-rich countries in Asia. Plants of herbal origin have long been used in India's traditional medical systems, such as *Ayurveda*, *Siddha*, and *Unani* form of medicine. These systems of medicines are directly related to the drugs of plant-animal and mineral origin. Globally it is estimated that about 80% of people of 4 billion cannot afford the products of the modern industries so these peoples only rely on the traditional products and medicines of plant origin.^[1,2] The forests of India having a rich source of medicinal plants and aromatic plants. In *Ayurveda*, there are approx. 8000 herbal remedies that have been codified. In *Rigveda*, 67 medicinal plants have been recorded, in *Yajurveda* 81 species, in *Atharvaveda* 290 species, in *Charaka* and *Sushruta Samhita*, respectively 1100 and 1270 species have been described according to their properties and uses. In today's era, the *Ayurvedic* system has become very popular in India and other countries also i.e., Nepal, Bhutan, Sri Lanka, Bangladesh, etc.

There are more than 391000 plants are present in the entire world and *arjuna* is one among them. *Arjuna* is a very popular ancient herbal plant. Botanically this plant is known as *T. arjuna*, and it belongs Table 1 to 3 to the family *Combretaceae* (Figure 1–3). This plant is commonly known for its cardioprotective activity. References regarding the *arjuna* plant are available in different *Ayurvedic* literature, which is described by different acharyas. Chemical constituents present in *Arjuna* play a very important role (Table 4–6). *Arjuna* is a large deciduous tree with drooping branches and a spreading crown. This plant is found commonly throughout India in the

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Indo sub-Himalaya region in Uttar Pradesh, Bihar, Nagpur, Delhi, Punjab, Deccan region, Burma, Madhya Pradesh, etc. and grows commonly near the banks of the river. It can also be found in Sri Lankan and Mauritian forests. This plant can grow in various soil types, but it prefers moist, fertile loam and red lateritic soils. Seeds propagate this plant, and germination takes 50-70 days with a 50 to 60% germination rate.^[3] "*Zingiberaceous Medicinal...* - Google Scholar, n.d.)



Figure 1: *Terminalia arjuna* tree

Classical Review of *T. arjuna***Table 1:** Arjuna gana (group) classification and synonyms in ayurvedic literature:

Sr. No.	Text name	Gana (group)	Synonyms
1.	Charaka Samhita ^[4] (Sastri, K., Charak Samhita by Agnivesa. Chaukhambha Bharti Academy, Varansi, n.d.) (1000 B.C.)	Kashayaskandha gana, Udardamahakasaya, udardaprashmana, mahakasaya	Arjuna
2.	Sushruta samhita ^[5] (Yadavji, A.T., Sushruta Samhita by Sushruta. Krishnada Academy, Varanasi, n.d.) (1000 B.C.)	Salasaradigana, nyagrodhadi	Arjuna
3.	Ashtanga hridaya ^[6] (Vidyanath, R., A Hand Book of Astanga Sangraha. Chaukhamba Surbharati Prahashan, Varanasi, India, n.d.) (7 th century A.D.)	Nyagrodhadigana, asnadi gana	Arjuna, partha
4.	Dhanwantari nighantu ^[7] (Kamat, S., Dhanvantari nighantu. Chaukhambha Sanskrit Pratisthan, Delhi, n.d.) (10 th -13 th century A.D.)	Amradi varga	Arjuna, chitrayodhi, dhanunjaya, kakubha, kireeti, partha, nadisarja, shatadruma, veerantaka
5.	Raj nighantu ^[8] (Tripathi, I. and V. Dwivedi, Raj Nighantu. Chaukhamba Krishnadas Academy, Varanasi, n.d.) (15 th – 17 th century A.D.)	Prabhadradi varga	Arjuna, chitrayodhi, dhanunjaya, dhanvi, dhurthabhu, gandivi, indra sunusca, kireeti, karnari, kuruveeraka, kauntheya, krishnasarathi, nadisarja, partha, phalguna, pruthaja, shambara, shivamallaka, savyasachi, shatadruma, veerantaka, veeradru
6.	Bhaisajyaratnavali ^[9] (Sen, G., Bhaishajya ratnavali, Hindi Commentary by Ambikadutta Shastri. Chaukhamba Sanskrit Sansthan, n.d.) (18 th century A.D.)	Described for treatment	Arjuna, kakubha
7.	Astangasangraha ^[6] (Vidyanath, R., A Hand Book of Astanga Sangraha. Chaukhamba Surbharati Prahashan, Varanasi, India, n.d.) (6 th century A.D.)	Nyagrodhadigana	Kakubha, arjuna, svetavaha
8.	Haritasamhita ^[10] (Rabb, U.N., The Harita Samhita-A Literary Review on an ancient Ayurvedic text. Journal of Ayurveda and 104Integrated Medical Sciences (ISSN 2456-3110), n.d.) (12 th century A.D.)	Described under uses of different formulation	Arjuna, kakubha, gandiva
9.	Siddha sara samhita ^[11] (Vidyanath, R., Siddhasara Samhita. 2019, n.d.) (7 th century A.D.)	Nyagrodhadigana, shaladigana	Partha, arjuna
10.	Chakradatta (Tripathi, J. and B. Shastri, Chakra Dutta. 1983, Chaukhambha Sanskrit Series, n.d.) (11 th century A.D.)	Described for treatment	Arjuna, kakubha, partha
11.	Sarangdharsamhita ^[12] (Tripathi, B., Sharangadhara samhita. Chaukhambha Surabharati Prakashan, Varanasi, n.d.) (13 th century A.D.)	Nyagrodhadigana	Arjuna, kakubha
12.	Bhavaprakash ^[13] (Chunekar, K.C. and G. Pandey, Bhavprakash nighantu. Chukhamba bharti academy, Varanasi, n.d.) (16 th century A.D.)	Described in the form of various preparation and indicated for diseases, vatadi varga	Arjuna, kakubha
13.	Yoga ratnakara ^[14] (Shastri, B., Yogaratnakara. Vidyotini Hindi Tika by Vd Laxmipati Shastri Ayurvedacharya, Nityaprakruttiprakara, verse, n.d.) (17 th century A.D.)	Described for treatment	Arjuna, kakubha

Table 2: Preparation and uses of *T. arjuna* mentioned in ayurvedic texts

Sr. No.	Text	Preparation	Uses
1	Charaka samhita ^[4] (Sastri, K., Charak Samhita by Agnivesa. Chaukhambha Bharti Academy, Varansi, n.d.)	Churna Asava Kwatha Leha	Tvak roga Sarasava Kaphaja and pittaja prameha Kaphaja hridroga
2	Sushruta samhita ^[5] (Yadavji, A.T., Sushruta Samhita by Sushruta. Krishnada Academy, Varanasi, n.d.)	Churna Kwatha Kalka Phanta	Raktatipravriti Sukrameha, prameha Pittaja upadasma Raktapitta
3	Astanga hridaya ^[6] (Vidyanath, R., A Hand Book of Astanga Sangraha. Chaukhamba Surbharati Prahashan, Varanasi, India, n.d.)	Ghrita Kwatha Gutika Lepa Churna	Kunaparetas Sheetada, mutraghata Mukharoga Vyanga, twakroga Kaphaja prameha
4	Astanga sangraha ^[6] (Vidyanath, R., A Hand Book of Astanga Sangraha. Chaukhamba Surbharati Prahashan, Varanasi, India, n.d.)	Dhupa Kwatha Lepa Churna Taila	Vishaghna Mudhagarbha, raktapitta, kaphaja roga Kustha rog Vrana Sadyovrana
5	Harita samhita ^[10] (Rabb, U.N., The Harita Samhita-A Literary Review on an ancient Ayurvedic text. Journal of Ayurveda and 104Integrated Medical Sciences (ISSN 2456-3110), n.d.)	Churna Kwatha Lepa	Madhumeha Raktaja gulma, kaphaja prameha, danta rog, mukhapaka Twak rog, shiro rog, vrana
6	Siddha sara samhita ^[11] (Vidyanath, R., Siddhasara Samhita. 2019, n.d.)	Kwatha	Prameha, pittaja prameha
7	Chakradatta ^[12] (Tripathi, J. and B. Shastri, Chakra Dutta. 1983, Chaukhambha Sanskrit Series, n.d.)	Kshira Churna Ghrita	Raktatisara Hridroga, jwara, raktapitta, rasayana, kustha All types of hridrog
8	Chikitsa saraangraha ^[12] (<i>Chikitsa Sara Sangraha - Google Scholar</i> , n.d.)	Kshira paka Churna	Hridayamaya Hridroga, jwara, raktapitta
9	Sarangdhar samhita ^[15] (Tripathi, B., Sharangadhara samhita. Chaukhambha Surabharati Prakashan, Varanasi, n.d.)	Kwatha Devadaryadiritsa	Raktapitta Prameha
10	Bhavaprakash ^[13] (Chunekar, K.C. and G. Pandey, Bhavprakash nighantu. Chukhamba bharti academy, Varanasi, n.d.)	Kshira Ghrita Churna with guda Taila	Yakshmaroga All types of hridroga Hridroga, jwara Ashmari
11	Yoga ratnakara ^[14] (Shastri, B., Yogaratnakara. Vidyotini Hindi Tika by Vd Laxmipati Shastri Ayurvedacharya, Nityaprakvrutti prakara, verse, n.d.)	Baladya ghrita Dhupa	Hridroga, kasa, raktapitta Krimi
12	Bhaisajya ratnavali ^[9] (Sen, G., Bhaishajya ratnavali, Hindi Commentary by Ambikadutta Shastri. Chaukhamba Sanskrit Sansthan, n.d.)	Churna Laksa guggulu	Swasa, kasa, hridroga Bhagna
13	Vangsen samhita ^[16] (Saxena, N., Vangasena Samhita or Cikitsasara Samgraha Of Vangasena. 2014, n.d.)	Taila Ghrita	Kaphaj and vataja prameha Hridroga

Table 3: Synonyms of *T. arjuna* in different languages as per the Ayurvedic Pharmacopeia of India

Sanskrit	Kakubha, partha, svetavaha
Assamese	Arjun
Bengali	Arjuna
Gujarati	Sadad, arjuna, sajada
Hindi	Arjuna
Marathi	Arjuna, sadada
Oriya	Arjuna
Punjabi	Arjon
Tamil	Mardam
Telugu	Maddi
Urdu	Arjun

MODERN REVIEW OF T. ARJUNA

In the modern period drugs are classified as under taxonomical classification^[17,18]: (Schostak et al., 2003) (Kaur et al., 2021)

- Kingdom : Plant kingdom
- Class : Dicotyledons
- Sub-class : Polypetalae
- Order : Myrtales
- Division : Magnoliophyta
- Family : Combretaceae
- Genus : Terminalia
- Species : Arjuna
- Latin name : Terminalia arjuna

ETHANO-BOTANICAL USES

In India, tribal peoples use Arjuna for various purposes. The tribes of khasis, garasia, sahariya, dhanka, knjar, bhil, meena, gujjar, etc. used Arjuna especially for the treatment for various purposes. The bark of Arjuna has been used to treat ulcers, fractures, anemia, diabetes etc. as per chakradatta the decoction of the bark of Arjuna is mixed along with milk, ghee or butter has been given cardio-protective effect.

In Tamilnadu, the traditional therapists used Arjuna bark powder boiled along with water and then inhaled it, this is used for the treatment of headache and kills worms that are present in teeth. The paste of fruit is used to cure wounds. This paste is directly applied to the wounds.^[19,20] (Muthu et al., 2006)

In Kerala, the Malabar tribes, prepared fresh juice of Arjuna leaf and it is used to treat the pain of the ears, and bark powder is used for heat treatment.^[21] (Yesodharan & Sujana, 2007)

In odisha, the tribal in sundargarh used dried powder of Arjuna bark with water of the washed rice to treat bloody urine. The tribes of malkangiri chewed the fresh bark of Arjuna and swallowed the juice, and it acted as an antacid.^[21] (Yesodharan & Sujana, 2007)

RASA PANCHAK

As per API

- Rasa : Kashaya
- Guna : Ruksha
- Veerya : Sheeta

Microscopic Description

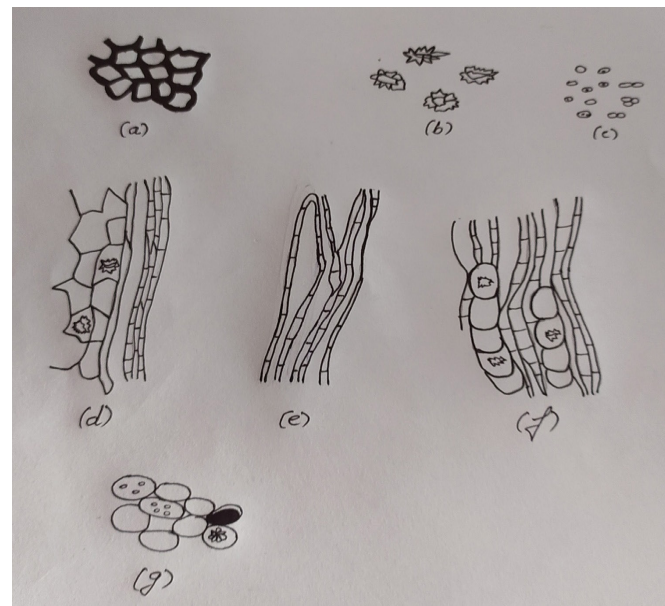


Figure 2: Bark

a) Cork fragments; b) Rossetts and clusters of calcium oxalate; c) Starch grains; d) Crystal fiber; e) Phloem fiber; f) Fragments of phloem region; g) Parenchyma containing rossettes of calcium oxalate, starch grains, and tannins.

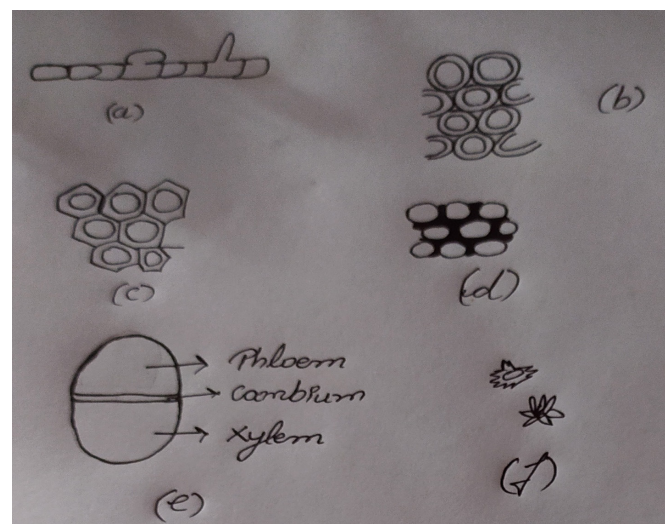


Figure 3: Leaves

a) Epidermis layer with non glandular and glandular trichomes; b) Parenchyma cells; c) Schlerenchyma cells; d) Collenchyma cells; e) Open vascular bundle; f) Calcium oxalate crystals.

- Vipaka : Katu
- Parbhav : Kapha har

DESCRIPTION OF T. ARJUNA

Macroscopic description^[22,23] (Choudhari et al., 2011; Health & Welfare, n.d.)

The bark of Arjuna is available in pieces. Pieces of the bark are flat, curved, recurved. The bark is channelled to half quilled. The thickness of the bark is 0.2–1.5 cm. The bark’s outer surface is relatively smooth and grey, and its inner surface is slightly

Table 4: Phytochemicals and chemical constituents of *T. arjuna*

Part used	Chemical constituents ^[24-28]
Stem bark	<i>Triterpenoids and tannins</i> Arjunic acid, arjunin, Arjunetin, lactone, Arjunanin, arjunolic acid, Casuarinin <i>Flavonoids and phenolics</i> Arjunolone, baicalein, catechin, gallocaechin, epicatechin, <i>Glycosides</i> Arjunoglucoside 1 and 2, terminoic acid, arjunoglucoside 4,5 terminoglucoside 1 and 2, terminoside A,
Root bark	Arjunoside 1,2 and 3, oleanoic, arjunic acid, arjunolic acid, beta sitosterol, (Anjaneyulu & Prasad, 1983) terminic acid ellagic acid, gallic acid, arjunetoside.
Fruit	Arjunic acid, arjunone, arachidic stearate, cerasidine, ellagic acid, friedelin, gallic acid, mleaolate
Leaves and seeds	Luteolin, 14-16 dianhydrogitoxygenin

Table 5: Phytochemical screening^[29-36]

<i>Test for phytosterols</i>	<i>Salkowski teaction test</i> Obtain a test tube 0.5 mL chloroform extract, 1-mL concentrated sulfuric acid, 1-mL chloroform extract, 1 ml concentrated sulfuric acid, 1-mL concentrated sulfuric acid, 1-mL concentrated sulfuric acid, 1-mL concentrated sulfuric acid, the presence of phytosterols is indicated by the existence of a reddish-brown colour in the chloroform layer.	Present
<i>Test for triterpenoids</i>	<i>Liebermann-burchards test</i> After adding a few drops of acetic anhydride to the extract, it was boiled and allowed to cool. After cooling, apply concentrated sulfuric acid from the test tube's edges, forming a brown ring at the junction of the two layers and a deep red hue, indicating the presence of triterpenoids.	Present
<i>Test for saponins</i>	<i>Foam test</i> Fill a test tube with a small amount of extract and a small amount of water, and shake vigorously. Saponins can be detected by the presence of foam that lasts for 10 minutes.	Present
<i>Test for alkaloids</i>	<i>Dragendroff's test</i> Various extracts of the herbal drugs were dissolved in chloroform. After evaporating the chloroform, a few drops of Dragendroffs reagent were added to the residue to acidify it (potassium bismuth iodide). The formation of an orange-red precipitate suggested the existence of alkaloids.	Present
<i>Test for carbohydrates</i>	<i>Molisch test</i> To form a layer, the extract was mixed with molisch reagent and then concentrated sulfuric acid was added from the test tube walls. The presence of a reddish-violet ring indicates the presence of carbohydrates.	Present
<i>Test for flavonoids</i>	<i>Lead acetate test</i> Adding a few drops of 10% lead acetate solution to the extract's alcoholic solution. The formation of a yellow precipitate shows the existence of Flavonoids.	Present
<i>Test for lactones</i>	<i>Legal's test</i> Transfer sodium nitroprusside and pyridine to the extract mixture. After that, sodium hydroxide was added to the mix. Lactones were detected by the appearance of a deep red shade.	Present
<i>Test for phenolic compounds and tannins</i>	<i>Ferric chloride test</i> Drop 2ml ferric chloride solution into test tube one at a time. The presence of phenolic compounds and tannins is indicated by the appearance of a bluish-black precipitate.	Present
<i>Test for proteins</i>	<i>Ninhydrin test</i> A few drops of ninhydrin should be added to the extract. The presence of amino and protein is shown by the appearance of blue colour, which may sometimes result in a positive result.	Present
<i>Test for glycosides</i>	<i>Keller-killiani test</i> Add 1 ml glacial acetic acid and a few drops of ferric chloride to the extract, as well as concentrated sulfuric acid through the test tube's ends. The presence of glycosides is indicated by the appearance of a reddish brown ring at the liquid-liquid interface.	Present

Table 6: Identity, purity and strength as per API

Foreign matter	NMT 2%
Total ash	NMT 25%
Acid insoluble ash	NMT 1%
Alcohol soluble extractive	NLT 20%
Water soluble extractive	NLT 20%

fibrous and pinkish. Fracture is short, and the taste is bitter and astringent.

Arjuna leaves are simple, oppositely borne, acute and obtuse at the apex, and glabrous (4–6 inches long and 2–3 inches wide). The plant's unique characteristic is the presence of two glands at the base of the petiole.

The flowers are greenish-white or creamy in color and have a sweet fragrance. Inflorescences have flowers at the ends of the shoots and in the axils of the stems. The pedicle is absent, and they are directly attached to the inflorescence axis. Petals are also absent.

The fruit is ovoid and up to 6 cm long. When fruit mature, it becomes woody and hard, and it contains 5 veins of the wings curve upwards from the axis. The type of the Arjuna fruit is a drupe which means a fruit that never splits open to release seed.

ADULTERANTS

For adulteration the dried bark of the *Terminalia tomentosa* is used and it can be distinguished from the bark of Arjuna by:

Fluorescence test

The ethereal extract of the *T. Arjuna* gives the fluorescence of pink color and *Terminalia tomentosa* gives the fluorescence of pale blue.^[37,38] (Paarakh, 2010)

Pharmacological Activities

Cardio-protective Activity or Cardiotonic Activity

Traditionally Arjuna is used to treat heart disease. It is reported that the powder of bark contains arjunolic acid and it has cardiotonic properties.

Rose and Treadway reported that arjuna is effective in various cardiac disorders, i.e., angina, myocardial infarction, hypertension, hypercholesteremia, cardiac arrest, etc.^[39]

Antimicrobial Activity

Antimicrobial activity of Arjuna bark aqueous extract showed against *Proteus vulgaris*, *Escherichia coli*, and *Pseudomonas aeruginosa*. It is reported that the acetone, alcoholic and aqueous extract of Arjuna leaves and bark shows the activity against microbes. Acetone leaf extract is best against *S. aureus*.^[39]

Anticancer Activity

It is reported that Arjuna extract shows to enhance the increased percentage of life and it inducing DNA damage in hepG2 cells revealed that Arjuna extract causes apoptosis and produces reactive oxygen species (ROS).^[40]

Antifungal Activity

It is reported that the five species of *Terminalia* i.e., *Y. arjuna*, *T. chebula*, *T. bellerica*, *T. catappa* and *T. alata*, the extract of

Table 7: Ayurvedic formulations of *T. arjuna*

Name of formulations	Therapeutic uses
Arjuntwak churna	Goof for heart, fever and raktapitta
Arjunaghrita	Heart diseases
Arjunaksheerpaka	Heart diseases
Arjunarishta	Heart and lung disorder, provide strength, boost immunity
Godhumarjunavaleha	Used in all types of heart diseases
Kakubhadichurna	Used in all types of heart diseases
Laksadi guggulu	Fracture and dislocation of bones
Baladighrita	Heart diseases
Arvindasava	All kind of pediatric condition psychosis and loss of strength
Devadarvyarista	Diabetes
Dhatakyaditaila	Diseases of post pregnancy
Ratnakara rasa	Heart diseases
Nagarjunabhra rasa	Heart diseases
Chintamani rasa	Heart diseases
Prabhakarvat	Heart diseases
Shankar vati	Heart diseases

these five plants were tested with plant pathogenic fungi, i.e., *A. flavus*, *A. alternaria*, *A. brassicicola* etc. shows the inhibitory action against pathogenesis.^[41]

Antidiabetic Activity

It is reported that the arjuna extract has antidiabetic activity. Arjuna extract could increase insulin secretion, which can react to the repression of the gluconeogenic key enzymes.^[42]

Antiacne Activity

It is reported that antiacne activity of arjuna extract. This extract is effective against *Propionibacterium acnes* and *Staphylococcus epidermidis*.

It is reported that herbal acne cream is safe, effective, non-toxic, and improves patient compliance^[43] (Aghera, H., et al. "A Notable Review on Terminalia... - Google Scholar, n.d.).

Wound Healing Activity

It is reported that extract of Arjuna bark shows the activity of healing rat dermal wounds because the extract contains hydroalcoholic phytoconstituents.

It is reported that Arjuna can complete epithelisation of excision wounds and increase tensile strength of incision wounds.^[44]

Anti-inflammatory Activity

It is reported that the ethanolic extracts of the dhatura, arjuna, and Ashwagandha have an anti-inflammatory property and they can resist the cyclooxygenase enzyme.

It is reported that the aqueous and alcoholic extract of stem bark is very good as anti-inflammatory activity.^[45]

Insecticidal Property

It is reported that arjuna has insecticidal property against *Spilargia oblique*.

Table 8: Role of phytoconstituents of Arjuna against urolithiasis

Extract	Part used	Phytoconstituents	Result	References
Aqueous Ethanol Hexane Ethylacetate	Bark	Tannins, saponin, terpenoids, flavonoids and phenols.	Inhibition of calcium oxalate and calcium phosphate crystallization	[25] (Chaudhary et al., 2010)
Butanolic	Bark	Saponins	Inhibition of calcium oxalate and calcium phosphate crystallization	[40] (NOPR: Urolithiasis: Phytotherapy as an Adjunct Therapy, n.d.)
Ethanol	Bark	Phenol, Flavonoids, Tannins, Terpenoids, Saponins, Glycosides, alkaloids	Protect kidney against ccl4, arjuna shows antiurolithiatic activity possibly through an antioxidant	[43] (Rai et al., 2020)
Aqueous	Bark	4 anionic antilithiac protein	Inhibit activity against calcium oxalate crystallization and crystal growth kinetic and crystal adhesion to renal epithelial cells	[43] (Amisha Mittal et al., 2016)
Aqueous	Bark	Flavonoids	Inhibit nucleation and aggregation of calcium oxalate crystals or inhibit their growth	[35] (A. Mittal et al., 2015)
Aqueous	Bark	Flavonoids, Saponins	Inhibit growth of calcium oxalate crystals	[36] (A. Mittal et al., 2016)

Gastro-protective Effect

It is reported that arjuna has gastro-protective activity because of its cytoprotective nature.^[46]

ROLE OF *T. ARJUNA* IN UROLITHIASIS^[47,48]

(Chaudhary et al., 2010)

The extract which is prepared from the dried bark of the *T. arjuna* is used in urolithiasis. The dried bark of the arjuna was boiled in distilled water. Prepare extract and after the preparation of extract, filter it with the help of filter paper and then evaporate the filtrate in vacuum and then dry it with the help of rotator evaporator at 60°C. Then it is stored in the sterile bottle. Then the dried sample was reconstituted in water to 1000 microgram/mL at the time of the experiment and it was referred to as an aqueous extract of Arjuna and then; this extract was used in the *in vitro* calcium phosphate assay and calcium oxalate crystal assay.

TRADITIONAL USES

Traditionally arjuna is used widely for therapeutic purposes. Fresh arjuna leaves juice is used to treat the earache, and paste of the roots is used in the headache. In Chhattisgarh, the decoction of the stem bark is used to reduce the sugar level, blood filtering, and remove clots from blood vessels.^[47] (Pandey, 2021). The paste of the fruit was used as a traditional healer, both topically and internally, in the treatment of cough, sore throat, dyspepsia. The bark is the main part of the arjuna, used in Ayurveda and allopathy for various diseases. On snakebite and scorpion sting, the ash of the bark is prescribed. This act as astringent, cooling

cardiotonic, urinary astringent, hypertension, inflammation, skin disorder etc (Table 7-8).^[40]

VARIETIES OF *T. ARJUNA*

Terminalia tomentosa (combretaceae)^[48]:

English name: Indian laurel

Synonyms: *T. allata*, *T. elliptica*, *T. tomentosa*

Plant Distribution and Description

This variety of arjuna is widely distributed in India and Burma. This plant grows upto 100 ft. it is an evergreen tree with drooping branches. Bark of the tomentosa is smooth and grey, very hard bark with dark color streaks and leaves are simple but usually sub opposite and pale green. Base is round to cordate, and the apex is shortly acute and obtuse, the venation is reticulate. Flowers are sessile and white, and spikes are present over it. Fruit is a drupe which is generally ovoid and obovoid in shape. Fruit is woody and glabrous and 5 to 7 curved wings are present.

DISCUSSION AND CONCLUSION

To cure the diseases fast, people used the modern system of medicine without knowing their side effects and then the Ayurvedic system of medicine has lacked behind a modern system of medicine. However, in the recent few years, the Ayurvedic system of medicine has grown rapidly and set up a huge Ayurvedic industry. Since then, herbal medicines and plants are in great demand. Based on the review, it is concluded or estimated that various studies have been done on arjuna plant. This plant is very much popular in the ancient period or as well as in the modern period also. *Arjuna* is available in various

forms in the market, which is very beneficial for the heart. Various pharmacological activities of these plants have been reported, and it consists of a wide range of active constituents. Description about *Arjuna* is mentioned in almost all samhitas, nighantus and Ayurvedic texts, so the references regarding arjuna are available in Ayurvedic traditional literature. Various uses of arjuna have been mentioned, indicating the popularity of the plants in the Ayurvedic system of medicine. The tribal people also use *Arjuna* for heart diseases. There are now traditional as well as modern formulations of arjuna are available in the market. The main objective of this review is to explore knowledge about the plant. In recent studies, it is reported that this plant is also very useful in urolithiasis. At last, it is recommended that new studies will be required for exploring different activities of this plant in the future.

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