A NOTABLY REVIEW ON TERMINALIA ARJUNA AND ITS IMPERATIVE AYURVEDIC FORMULATIONS: AN OVERVIEW  
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ABSTRACT  
The knowledge of Ayurveda is probably one of India’s greatest offerings to human empire. It is eternal in the profound sense that it remains pertinent for all times. There are plentiful articles found regarding Ayurvedic single drugs and formulations, however, most of them are with the deficiency of permutation of modern aspect and Ayurveda aspect. Hence, the review of Terminalia Arjuna (Roxb.) Wt. & Arn and its valuable formulation has been made with classical facts with logical portrayal, including evidences from Vedas, Samhitas, Medicinal books, Tribal colonies and different search engines on podium. This review article reflects history, properties, chemical constituents, pharmacological actions, toxicity, and different uses of plant Terminalia Arjuna (Roxb.) Wt. & Arn. and reasonable role of various formulations and media incorporate with the same plant. In sum up, this sort of review would serve as the most important step to engender new approach of Ayurvedic drug research, a path to sense possible alterations in drug formulations and ultimately new drug discovery.  
Keywords: Arjuna, Ayurveda, Ayurvedic formulations, Termianalia arjuna

INTRODUCTION  
Ayurvedic classics treasures a rich repertory of medicinal plants used for the treatment, management and/or control of different types of diseases. Knowledge about the healing property of medicinal plants used in Ayurvedic therapeutics mentioned in classics is a result of astute clinical observations made over centuries. Details about their properties and therapeutic applications are available in ancient scriptures like Vedas, Samhitas and Puranas. Compilations of later periods that are called Nighantus also contain enormous amount of information. The current global trend towards utilization of plant-derived natural remedies has, therefore, created a dire need for accurate and up to date information on the properties and uses, efficacy, safety and quality of medicinal plant products. Hence, the review of traditional medicinal plant and their formulations mentioned in Ayurvedic classics is crucial in present era. Terminalia Arjuna (Roxb.) Wt. & Arn is of them having enormous influence in Ayurvedic system of medicines. In Rigveda, the word ‘Arjuna’ is used either to indicate the white colour or one of taintless fame and glow like silver. It may be the first reference of Arjuna used as medicine stated in chief or principle sutra volume of Atharvaveda, Kaushiksutra (400-300 B.C.). Further synonyms and properties of Arjuna are mentioned in Bhavprakash Nighantu. Later on Chakradatta, the great ancient physician, recommended uses of Arjuna bark in form of decoction with milk (Kshirpaka) or as a ghrita (a preparation with ghee). Since, detailed combined assessment on modern aspects as well as Ayurvedic classical preparations of different formulations of Arjuna along with scientific symposium were not available on one platform during extensive literature search hence it was thought worthwhile to undertake detailed review study. Immense effort was made to compile the details of Arjuna and its imperative formulations used in Ayurvedic System of Medicines.  

ARJUNA  
Terminalia Arjuna (Roxb.) Wt. & Arn., is commonly known as Arjuna, large evergreen tree belonging to family Combretaceae. It is distributed throughout the greater part of the Indian peninsula along rivers and found in sub Himalayan tract, Chhota Nagpur, Orissa, West Bengal, Pun-
And Its Imperative Ayurvedic Formulations: An Overview

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Prabhava: Hridya

Doshaghnata: Kaphapittashamaka

Margaghanata: Vrana, Raktasrava, Asthi-
hagna, Rakttisara, Raktapradastra, Charma-
roga, Arsha, Prahema, Jeernajwara

Karma: Rakstastambhana, Sandhaneeya,

Vranaropana, Stamthana, Hridya, Hridaya-
ottejaka, Raktaprasadana, Kaphaghna,

Mootrasangrahaneeya, Jwaragha, Medo-
harा, Vishaghna, Balya.8

TRIBAL AND TRADITIONAL USES OF ARJUNA

Fresh juice of leaves of Arjuna is used for the treatment of earache in South India and root paste is applied on headache.10 Paste of leaf made with sugar and milk given once a day for 20 days for the treatment of sperma-
torrhoea.11 Traditional healers from South India uses fruit paste topically on wounds.12 Tribal living in Orissa uses dried bark of Arjuna powder along with rice washed water to treat blood in urine, and chew the fresh bark and swallow the juice as an antacid.13 In Tamil Nadu, peoples boiled the bark powder with water, and inhale it to cure headache and to kill worms in teeth.11 De-
coction of the bark has used as ulcer wash, while bark ash is prescribed for snakebite and scorpion sting.14 Stem bark of Arjuna is having tremendous uses described in classical texts. It is act as

CHEMICAL CONSTITUENTS

The medicinal plants used in traditional medical system have proven to be an abun-
dant source of novel biological active com-

pounds, many of which have been basis for the development of new lead chemicals for pharmaceuticals for new drug discovery. There are many chemical compounds found in Arjuna bark including: arjunic acid, ar-junetin, arjunolone, terminic acid, arjunol-

litin, arjunegenin, arjunglucoside I and II, arjunglucoside III. Tannins in bark containing catechin, gallo catechin, epicatechin and epigallo catechin.

Moreover, arjunolic acid, tomentosic acid, β-sitosterol, ellagic acid, (+)-leucodelphinidin, arjunin, arjunophth-

anoloside, terminoside A, casuarinian, termi-
arjunoside I and II, arjunglucoside IV and V, arjunasides A-E, 2α, 3β-di hydroxyurs 12, 18 dien-28 oic acid 28 o-β-D-glucopyranosyl ester were reported in bark of T. arjuna.15

PHARMACOCHEMICAL STUDIES

T. arjuna has a wide range of usefulness in indigenous medicine. It possesses pharmacological actions like cardioprotective activity,16 hypolipidemic and anti-

atherosclerotic activity,17-18 anti-oxidant ac-
tivity,19 analgesic, anti-inflammatory and immunomodulatory activity,20 anti-tumour activity,21 anti-carcinogenic activity,22 and anti-mutagenic effects.23 Moreover, Arjuna bark has anti-ulcer activity,24 hepatoprotective activity,25 wound healing activity.26 It possesses anti-diabetic activity,27 antiviral activity28 and reproductive activity.29 The pharmacological activities of T. Arjuna bark including research work has been on raw bark, aqueous extract, alcoholic extract, ethanolic extract and a range of isolated compounds like tannin fractions, arjunolic acid and triterpenoids. There is no any scientific evidence found regarding pharmacological activity of classical formulations of Arjuna bark as it is upcoming trend in current era and future market.

TOXICITY

No major toxicity has been documented of T. Arjuna. The results from acute oral toxicity

study suggested that ethanolic extract of T. Arjuna at limit dose of 2000 mg/kg did not produce any kind of toxicity in ani-
mals.18 Further administration of T. Arjuna resulted in reduction of thyroid hormone

jab, Daccan and Konkan.3 The classical names of Arjuna are Dhavala, Kakubha, Nudisarja, Veeravriksha, Partha, Indradrug.6 Generally stem bark, fruits and leaves of Ar-

juna are used in the therapeutics.7 The ther-

peutic human dose of juice is 10-20 ml; powder 3-6 gm; decoction 50-100 ml;8 and

kshirpaka10-12 ml.9

PROPERTIES AND ACTION

Rasa: Kasaya

Guna: Laghu, Raksha

Veerya: Sheeta

Prabhava: Hridya

Doshaghnata: Kaphapittashamaka

Margaghanata: Vrana, Raktasrava, Asthi-
hagna, Rakttisara, Raktapradastra, Charma-
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mals.18 Further administration of T. Arjuna resulted in reduction of thyroid hormone
concentration in euthyroid animals, whereas the hepatic LPO has been increased. Thus, high amount of the plant extract should not be consumed, as it may induce hepatotoxicity as well as hypothyroidism. In clinical studies mild side effects like nausea, gastritis, headache, bodyache, constipation, and insomnia have been reported. No haematological, renal, or metabolic toxicity has been reported on *T. arjuna* even after longer administration of more than 24 months.

### Ayurvedic Formulations of Arjuna

In ancient period physician designed drugs according to the specific need of individual patient. Drugs were used in crude as well as processed forms and converted into different formulations as per need. It is necessary that the form of the drugs or formulations when ready for ingestion should be not only effective but also easy to administer, palatable and agreeable to the patients. Current scenario of preparation of different formulations from single crude drug mainly associated to safety, efficacy, stability and palatability. Ayurvedic system of medicines also gives prime importance to these four basic requirements as well as other Ayurvedic fundamentals while formulating the drugs. *Arjuna* is one of the ingredients of many imperative formulations used in the Ayurveda. The list of different formulations of *Arjuna* in which *Arjuna* is used as main ingredient or secondary ingredient along with doses, uses, *anupana* and self-life have been summarized in **Table 1 and 2** respectively.

**Table 1. Some formulations having emphasis of *T. Arjuna* as main ingredient:**

<table>
<thead>
<tr>
<th>Name of formulations</th>
<th>Ingredients</th>
<th>Dose</th>
<th>Anupana</th>
<th>Therapeutic uses</th>
<th>Self-life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arjuntwakchurna⁴⁷</td>
<td><em>Terminalia arjuna</em> (Roxb.) Wt. &amp; Arn. bark</td>
<td>3 g</td>
<td>Clarified butter</td>
<td>Good for Heart, fever, raktaipitta</td>
<td>6 months</td>
</tr>
<tr>
<td>Arjunaghrita⁴²</td>
<td>Juice of <em>Arjuna</em> bark (16 parts), Clarified butter (4 parts), Paste of <em>Arjuna</em> bark (1 part)</td>
<td>6 g</td>
<td>Warm water or warm milk</td>
<td>Heart diseases</td>
<td>16 month</td>
</tr>
<tr>
<td>Arjunaksheerapaka⁴⁹,⁵⁰</td>
<td>Powder of <em>Arjuna</em> bark (1 part), Cow milk (8 part), Water (32 part)</td>
<td>10 to 12 ml</td>
<td>Heart diseases</td>
<td>Use freshly</td>
<td></td>
</tr>
<tr>
<td>Arjunarista⁴²</td>
<td>Powder of <em>Arjuna</em> bark (4.80 kg), <em>Vitis vinifera</em> fruits (2.40 kg), <em>Madhuca indica</em> flower (0.96 kg), <em>Woodfordia fruticosa</em> flower (0.96 kg), Jaggery (4.80 kg), Water (49.15 lit)</td>
<td>12 to 24 ml</td>
<td>Heart and lung disorders, for strength/immunity, azoospermia</td>
<td>As good as old</td>
<td></td>
</tr>
<tr>
<td>Godhumarjunavlehyal⁴⁹,⁵¹</td>
<td>Wheat flour (50 g), Sesame oil (12 ml), Clarified butter of cow (12 g), Jaggary (50 g), Powder of <em>Arjuna</em> bark (6 g), Water (100 ml)</td>
<td>-</td>
<td>Sugar added milk</td>
<td>All type of heart disease</td>
<td>2 year</td>
</tr>
<tr>
<td>Godhumarjunapakap⁴⁹,⁵¹</td>
<td>Wheat flour (46 g), Clarified butter of cow (46 g), Sugar (50 g), Goat milk (100 ml), powder of <em>Arjuna</em> bark (3 to 6 g), Honey (10 g)</td>
<td>-</td>
<td>Honey</td>
<td>All type of heart disease</td>
<td>2 year</td>
</tr>
<tr>
<td>Kakubhadichurna⁹</td>
<td>Equal parts of <em>Arjuna</em> bark, <em>Vacha</em>, <em>Rasna</em>, <em>Balamool</em>, <em>Nagabala</em>,</td>
<td>3 g</td>
<td>Clarified butter</td>
<td>All type of heart diseases</td>
<td>1 year</td>
</tr>
</tbody>
</table>
Table 2. Some other formulations having emphasis of T. arjuna as secondary ingredient:

<table>
<thead>
<tr>
<th>Name of formulations</th>
<th>Dose</th>
<th>Anupana</th>
<th>Therapeutic uses</th>
<th>Self-life</th>
<th>Role of Arjuna bark in formulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baladighrita</td>
<td>6 g</td>
<td>Warm water or warm milk</td>
<td>Heart diseases</td>
<td>16 months</td>
<td>As one of the ingredients to prepare decoction</td>
</tr>
<tr>
<td>Arvindasava</td>
<td>12-24 ml</td>
<td>Equal part of water</td>
<td>All kind of paediatric condition psychosis, emaciation and loss of strength</td>
<td>As good as old</td>
<td></td>
</tr>
<tr>
<td>Devdarvyarista</td>
<td>12-24 ml</td>
<td>Equal part of water</td>
<td>Diabetes</td>
<td>As good as old</td>
<td></td>
</tr>
<tr>
<td>Dhatakyadita</td>
<td>6 g</td>
<td>Warm water or warm milk</td>
<td>Diseases of post pregnancy</td>
<td>16 months</td>
<td>Bark of Arjuna is used as one of the ingredients to prepare paste for taila formulation.</td>
</tr>
<tr>
<td>Ratnakara rasa</td>
<td>1-2 pills</td>
<td>Water</td>
<td>Heart diseases</td>
<td>2 years</td>
<td>Juice or decoction of bark of Arjuna used as assimilation media</td>
</tr>
<tr>
<td>Nagarjunabhara rasa</td>
<td>1-2 pills</td>
<td>Water</td>
<td>Heart diseases</td>
<td>2 years</td>
<td></td>
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<tr>
<td>Chintamani rasa</td>
<td>1-2 pills</td>
<td>Water</td>
<td>Heart diseases</td>
<td>2 years</td>
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<tr>
<td>Prabhakarvat</td>
<td>1-2 pills</td>
<td>Water</td>
<td>Heart diseases</td>
<td>2 years</td>
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<tr>
<td>Shankar vati</td>
<td>1-2 pills</td>
<td>Water</td>
<td>Heart diseases</td>
<td>2 years</td>
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DISCUSSION

Arjuna is a widespread medicinal plant used in the Ayurvedic system of medicine to care for various ailments. Bhavapрак-akash has mentioned that Arjuna is having remarkable actions like hridya, medohar, sandhaniya, vishaghna pramehara and vranropsan attributable to its immense properties like laghu, ruksha, sheetal and kashay. It has been well documented that bark extracts contains acids (arjunic acid, termic acid), Glycosides (argentine, arjunosides 1-IV), strong anti-oxidants (flavones, tannins, oligmeric poanthocyanidins), Minerals (calcium, magnesium, zinc, and copper) etc. But it is not clear about the specific biological activity of individual constituents of Arjuna as well as responsible phytochemical moiety for its actions.

There are various classical preparations of Arjuna are mentioned in Ayurvedic classics. Several popular formulations have
been practiced since years like Arjuna Kshirapaka and Arjunarista. Kshiralkalpana is original kalpana of Sushruta and Arjuna Kshirapaka was first time prescribed by Acharya Vrinda in Hridrogachikitsa and the bark of Arjuna is used to prepare Arjuna Kshirapaka. While preparing Arjuna Kshirapaka, the quantity of milk indicated as eight times to the drug and water as four times to the milk. After boiling, when only milk part remains is considered as Arjuna Kshirapaka. Other scholars as Chakrpanidatta, Acharya Shodhala, Vanga Sen, Acharya Trimal Bhatta, Govindadasa Sen, who were of the opinion that fifteen times of milk quantity, should be taken to the quantity of drug and similar amount of water be added and boiled till milk part remains.

Kshirapaka is one of the unique preparations of Ayurveda. In fact through this preparation, potency of a drug is transferred into milk. Milk is a colloidal substance. It is worthy to mention here that water soluble as well as fat soluble fraction of a drug is transferred to Kshirapaka. To prop up to this statement, former study showed that milk decoction has a higher antioxidant capacity than water decoction. In addition, extraction of active ingredients, palatability and nourishing property of milk compose the formulation is ideal option of drug delivery system for the patients who have stumpy tolerance to various dosage forms and also need added nourishment.

Arishtas are made with decoctions of herbs in boiling water while asavas are prepared by directly using fresh herbal juices. These are unique liquid dosage form that contains self-generated alcohol. Arishtas are classical Ayurvedic preparations typically used as digestive and cardiotonic. It is weak spirituous preparations prepared in airtight sealed vessel by anaerobic fermentation of decoction of plant material, sugar and dried flowers of Woodfordia fruticosa (L.) Kurz (Lythraceae) occasionally supplemented with some other powdered dried plant materials. Fermentation probably results into transformation of several phytochemical compounds present in medicinal plants, thereby rendering them less toxic and more potent; besides helping in their absorption. Due to their medicinal value, sweet taste and easy availability people are prone to consume higher doses of these drugs for longer periods. Arjunarishta is commonly used oral liquid cardio tonic prepared using Arjuna as an active constituent. It nourishes and strengthens muscle and promotes cardiac functioning by regulating blood pressure and cholesterol.

Ghee is the unctuous substance par excellence because of its power to assimilate effectively the properties of other substances. It increases, thousand times in potency of drugs and develops manifold qualities. Ghee is widely used in medicinal formulations due to its unusual ability to assimilate the properties of herbs it is mixed with, without losing its own qualities. Finally, on a practical level, Ghee is rich in antioxidants and hence does not go rancid for a long time. In the days before refrigeration, this would have been invaluable in allowing formulations to be used for up to 16 months. In Ayurveda, Ghee is considered an effective “carrier” of the lipid-soluble portion of herbs and spices to the various parts of the body. In case of Arjuna Ghee, it is observed that toasting up of ethanolic extract of T. arjuna bark extract in Ghee has significant ability to enhance the antioxidant potential of Ghee. It also improved the phytosterol content and self-life of Ghee. Freshly prepared cow milk ghee in Arjuna Ghee possesses good prospective to act as free radical scavenger and thus could help in hindrance of many free radical related disorders.

Guggulu preparation is a unique preparation in which powdered drugs are integrated in pure Guggulu by pounding in it. Guggulu itself has rasayana property and some properties are increased by adding some powdered drug. In the Lakshadi guggulu, Arjuna is one of the ingredients which contain high amount of calcium and promotes fixation of fractured bone and increase healing power of the drug. Lakshadi guggulu has anti-inflammatory and analgesic activity. It also has antioxidant properties, antimicrobial activity and promotes general physical fitness. Therefore, the combination of Guggulu and Arjuna escort the formulation at acumen level to treat fractured bone.

In Godhumarjunapaka and lehyas, Arjuna bark churna is incorporate with wheat flour, clarified butter and jaggery or sugar. This formulation is more palatable
than other formulation and also enrich with such ingredients which reassure the body. It is as similar as halva of wheat flour in which we cannot recognise more taste of *Arjuna* powder. In short it is a smart recipe for heart patient.

Besides the classical formulation, individual always look for something more than he has. The recipes like *Arjuna Omelette* and *Arjuna En Upma* incorporating *Arjuna* bark showed good acceptability, meriting their inclusion in the daily diet of the people needing long-term intervention for elevated lipids and oxidative stress levels.

This transformed interest and perspective on traditional Ayurvedic formulations is also revealed in publications on Ayurvedic formulations as crude extracts. Thus, as assured earlier, there is “No longer a crude view of the crude extract”. ICMR guidelines also state that the traditional methods of Ayurvedic drug preparation cannot be set aside. Traditional formulations also should undergo scientific screening although it is incredibly complex mixture with other media as well drugs having different medicinal property. The mass screening of plants in the search for new drugs is vastly expensive and inefficient. It would be cheaper and perhaps more productive to re-examine plants and traditional formulations described in ancient and traditional texts.

**CONCLUSION**

On the basis of above review, it is fairly seen that bulk study has been done on crude powder and different extract of *Arjuna* bark, contrary negligible scientific studies were found on traditional formulation containing *Arjuna* bark as medicine. Traditional system used *Arjuna* as crude drug and also formulated with milk, clarified butter, self generated alcohol, *Guggulu* and other suitable stuffs for better therapeutic consequence as well as palatability and stability of the formulation. Likewise, the formulations prescribed with different *anupana* for superior bio-availability and to boost up supplementary significance of drug to treat different disorders. A vast scope exists for undertaking well planned multi-disciplinary studies in this field in which at most importance should be given to the concepts behind Ayurvedic formulations. This endeavour would be a great help in ensuring availability of standardized, efficacy and safety proven Ayurvedic formulations in the market.

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