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A NOTABLE 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.[1]

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.[2] 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.[3] 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).[4]

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 Combrataceae. 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-

jab, Daccan and Konkan.[5] The classical names of *Arjuna* are *Dhavala, Kakubha, Nadisarja, Veeravriksha, Partha, Indradru.*[6] Generally stem bark, fruits and leaves of *Arjuna* are used in the therapeutics.[7] The therapeutic human dose of juice is 10-20 ml; powder 3-6 gm; decoction 50-100 ml;[8] and *kshirpaka*10-12 ml.[9]

PROPERTIES AND ACTION

Rasa*: *Kasaya

Guna*: *Laghu, Ruksha

Veerya*: *Sheeta

Prabhava*: *Hridya

Doshaghnata*: *Kaphapittashamaka

Rogaghnata*: *Vrana, Raktasrava, Asthibhagna, Raktatisara, Raktapradara, Charmaroga, Arsha, Prahema, Jeernajwara

***Karma*: *Raktastambhana, Sandhaneeya, Vranaropana, Stambhana, Hridya, Hridayottejaka, Raktaprasadana, Kaphaghna, Mootrasangrahaneeya, Jwaraghna, Medohara, 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 spermatorrhoea.[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] Decoction 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 astringent, cooling, aphrodisiac, cardiotonic, demulcent, styptic, anti-dysentric, urinary astringent, expectorant, alexiteric, lithontriptic tonic, It is also use in some clinical conditions like fractures, ulcers, urethrorrhoea, spermatorrhoea, leucorrhoea, diabetes, anaemia, cardiac disorders, cough, tumour, excessive perspiration, fatigue, asthma, bronchitis, intrinsic haemorrhage, otalgia, diarrhoea associated with blood, cirrhosis of liver, hypertension, inflammation and skin disorders.[8]

CHEMICAL CONSTITUENTS

The medicinal plants used in traditional medical system have proven to be an abundant source of novel biological active compounds, 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, arjunetin, arjunolone, terminoic acid, arjunolitin, arjungenin, arjunglucoside I and II, arjunglucoside III. Tannins in bark containing catechin, gallocatechin, epicatechin and epigallocatechin.

Moreover, arjunolic acid, tomentosic acid, β-sitosterol, ellagic acid, (+)-leucodelphinidin, arjunin, arjunophthanoloside, terminoside A, casuarianin, termiarjunoside I and II, arjunglucoside IV and V, arjunasides A-E, 2α, 3β–dihydroxyurs 12, 18 dien–28 oic acid 28 o–β-D-glucopyranosyl ester were reported in bark of *T. arjuna.*[15]

PHARMACOLOGICAL STUDIES

T. arjuna has a wide range of usefulness in indigenous medicine. It has possesses pharmacological actions like cardioprotective activity,[16] hypolipidemic and anti-atherosclerotic activity,[17-18] anti-oxidant activity,[19] analgesic, anti-inflammatory and immunomodulatoryactivity,[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 activity[28] 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 triterpinoides. 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 animals.[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.[30] 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.[31]

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:

Name of formulations	Ingredients	Dose	*Anupana*	Therapeutic uses	Self-life[38]
Arjuntwakchurna[9]	*Terminalia arjuna (Roxb.) Wt. & Arn.* bark	3 g	Clarified butter	Good for Heart, fever, raktapitta	6months
Arjunaghrita[32]	Juice of *Arjuna* bark (16 parts), Clarified butter (4 parts), Paste of *Arjuna* bark (1 parts)	6 g	Warm water or warm milk	Heart diseases	16 month
Arjunaksheerpaka[9, 33]	Powder of *Arjuna* bark (1 part), Cow milk (8 part), Water (32 part)	10 to 12ml	-	Heart diseases	Use freshly
Arjunarista[32]	Powder of *Arjuna* bark (4.80 kg), *Vitis vinifera* fruits (2.40 kg), *Madhuca indica* flower (0.96 kg), *Woodfordia fruiticosa* flower (0.96 kg), Jaggery (4.80 kg), Water (49.15 lit)	12 to 24 ml	Equal part of water	Heart and lung disorders, for strength/ immunity, azoospermia	As good as old
Godhumarjunavlehya[9,33]	Wheat flour (50 g), Sesame oil (12 ml), Clarified butter of cow (12 g), Jaggary (50 g), Powder of *Arjuna* bark (6 g), Water (100 ml)	-	Sugar added milk	All type of heart disease	2 year
GodhumarjunaPaka[9,33]	Wheat flour (46 g), Clarified butter of cow (46 g), Sugar (50 g), Goat milk (100 ml), powder of *Arjuna* bark (3 to 6 g), Honey (10 g)	-	Honey	All type of heart disease	2 year
Kakubhadichurna[9]	Equal parts of *Arjuna bark, Vacha, Rasna, Balamool, Nagabala,*	3 g	Clarified butter	All type of heart diseases	1 year

	Haritaki, Kapoor, Pushkarmool, Piper, Shunthi				
Lakshadi Guggulu[34]	*Laksha churna* (12 g), *Asthishrikhala churna* (12 g), powder of *Arjuna* bark (12 g), *Ashwagandha churna* (12 g), *Nagbala churna* (12 g), *shuddha Guggulu* (60 g)	1-2 pills	Warm water	Fracture and dislocation of bones	2 year

Table:2. Some other formulations having emphasis of *T. arjuna* as secondary ingredient:

Name of formulations	Dose	Anupana	Therapeutic uses	Self-life[38]	Role of *Arjuna* bark in formulation
Baladighrita[9,33]	6 g	Warm water or warm milk	Heart diseases	16 month	As one of the ingredient to prepare decoction
Arvindasava[35]	12 to 24 ml	Equal part of water	All kind of paediatric condition psychosis, emaciation and loss of strength	As good as old	
Devdarvyarista[36]	12 to 24 ml	Equal part of water	Diabetes	As good as old	
Dhatakyaditaila[37]	6 g	Warm water or warm milk	Diseases of post pregnancy	16 month	Bark of *Arjuna* is used as one of the ingredient to prepare paste for taila formulation.
Ratnakara rasa[9]	1-2 pills	Water	Heart diseases	2 years	Juice or decoction of bark of *Arjuna* used as assimilation media
Nagarjunabhra rasa[9]	1-2 pills	Water	Heart diseases	2 years	
Chintamani rasa[9]	1-2 pills	Water	Heart diseases	2 years	
Prabhakarvat[9]	1-2 pills	Water	Heart diseases	2 years	
Shankar vati[9]	1-2 pills	water	Heart diseases	2 years	

DISCUSSION

Arjuna is a widespread medicinal plant used in the Ayurvedic system of medicine to care for various ailments. *Bhavaprakash* has mentioned that *Arjuna* is having remarkable actions like *hridya, medohar, sandhaniya, vishaghna pramehara* and *vranropan* 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 I-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 Kshirpaka* and *Arjunarista*. *Kshirakalpana* 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 *Chakrapanidatta*, *Acharya Shodhala*, *Vanga Sen*, *Acharya Trimal Bhata*, *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.[39] 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.[40] 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.[41]

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 totting 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.[42]

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.[43] *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 *lehya*, *Arjuna* bark *churna* is incorporate with wheat flour, clarified butter and jeggary 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 comfy 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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