



A REVIEW ON PHARMACOLOGICAL ACTION OF ARKA LAVANA: THE FORMULATION OF UPAVISHA ARKA

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ABSTRACT

Arka lavana is a well-recognised and highly effective Lavana kalpana. Lavana preparations are widely and largely prepared in pharmacy as well as used by practitioners of Ayurveda for different ailments. In Lavana kalpana particular heating pattern is followed for drug along with lavana in a sharava (earthen crucible) by subjecting it to putapaka. Arka lavana is one of the commonly used preparation containing very safe and easily available herbo-mineral drugs. It is mentioned in various classical texts like Bhaishajya ratnavali, Rasatarangini, Vangasen, Gadanigraha etc. A scrutiny of classical literature revealed use of Arka lavana in Yakrit-pleeha roga, Gulma, Ajirna, Agnimandya and Udara. Sufficient literary, preclinical and clinical data is not available to prove its mode of action. Thus, present study aims to review all possible references of Arka lavana and formulation ingredients to establish its probable mode of action.

Key words: *Calotropis procera*, Upavisha, Lavana kalpana, Arka Lavana, Putapaka

INTRODUCTION

Lavana kalpana is a dosage form mentioned in literatures of Ayurveda where lavana is the main ingredient in the formulation. It is prepared by combining lavana along with different herbs and subjecting them to heat. Most of the lavana kalpa are prepared by using puta, where the drugs along with lavana are placed in an enclosed sharava and subjected to fire eg. Dhatura lavana, Narikela lavana, Patra lavana etc.¹ Arka lavana is one such formulation used in everyday practise in the management of Yakrit-pleeha vikara, Udara roga, Gulma etc.² Arka (*Calotropis procera*) is classified as Upavisha (semi-poisonous plant) in Ayurveda by Bhavprakash and Rasatarangini.³ In spite of being Upavisha, it has been advocated with external and internal applications in various formulations for different ailments. It can give quick relief from various diseases and other toxicological conditions. As per classical texts, Upavisha are widely used in Ayurvedic formulations. Upavisha Arka, is one of them which finds its therapeutic application in 547 formulations given for the management of almost 58 diseases.⁴ Saindhava lavana is prime ingredient in Arka lavana and is considered as the best amongst five varieties of lavana. Its properties are described by various Acharyas with specific therapeutic indications.⁵

Arka lavana, is indicated in disease conditions like Udara, Gulma, Yakrit-pleeha rogas which are related to Hepatic, Spleen, Gastrointestinal diseases and Cancer. As per previous research work, only In vivo Hepatoprotective activity of Arka lavana was studied. Further studies are required to validate its therapeutic claims mentioned in Samhitas. So, it is essential to understand its mode of action. Mode of action of Arka lavana is not specified by classical as well as modern literature. Thus, this is an attempt to

collect all possible references of Arka lavana and to review the formulation ingredients to establish its probable mode of action. However, in order to understand the potential of Arka lavana, further preclinical and clinical studies are required to validate the mode of action.

REVIEW OF ARKA LAVANA

Arka lavana⁶

Ingredients:

1. Arka patra – 1 part.
2. Saindhava lavana – 1 part.

Method of Preparation

At first dry and clean sharava should be taken and fresh leaves of Arka (*C. procera*) is to be collected. The collected Arka leaves are then placed in a sandwich pattern with Saindhava lavana. The pattern is maintained in such a way that upper and lower layers should be of Arka leaves. Another sharava is to be placed over it and sealed it with seven-layer of mud (multani mitti) smeared cloth and after that it is subjected to fire (putapaka vidhi) and wait for self-cooling. After gradual cooling, the contents are removed from the pot and is grinded to a fine powder in khalva. The formulation is then preserved in an airtight container for further study.

Description: Fine powder, passing through sieve number 100; grey in colour, odourless, salty in taste.

Storage: It is stored in a cool place in tightly closed containers, protected from light and moisture.

Table 1: Arka lavana formulation according to various text

Sr. No	Indications	Matra	Anupana	References
1	Pleecha, Gulma, Udara roga ⁷	4 Ratti – 8 Ratti	Mastu	B.R 41/31
2	Yakrit, Pleecha, Udara, Malbhedan, Vatika, Shleshmak Yakrut roga ⁸	1/2 Masha	Koshna Jal, Mastu	R.T Tarang 4/77, 131-136
3	Kathin Pleecha, Yakrit Vriddhi, Gulma, Udara, Ajirna, Mandagni, Panduroga, Baddhakoshtata ⁹	1 Masha – 2 Masha	Koshna Jal, Gomutra	ASS
4	Pleecha, Gulma, Udara ¹⁰	4 Ratti – 1 Masha	Pleecha- Ghikuvvara rasa Gulma-Eranda tail, Koshna Dudha Udara - Gomutra, Eranda tail	SBS
5	Gulma, Pleecha, Udara ¹¹	1 Masha	Mastu	CD 37/43
6	Gulma, Pleecha, Udara ¹²	-	Mastu	BBR Kalp 76
7	Pleecharoga ¹³	-	Mastu	VS Kalp 139
8	Pleecha, Udara ¹⁴	-	Mastu	GN Kalp 705

*BR - Bhaishajya Ratnavali, RT- Rasatarangini, ASS - Ayurveda Sara sangraha, SBS - Siddha Bhaishajya Sangraha, CD - Chakradatta, BBR - Bharat Bhaishajya Ratnakar, VS- Vangasen, GN- Gada Nigraha

Study carried out on Arka lavana¹⁵

In vivo Hepatoprotective activity of Arka lavana against liver anomalies was evaluated experimentally in dexamethasone induced and ethanol-induced hepatotoxicity rat model.

Review of ingredients of Arka lavana

There are two ingredients in this formulation

1. Arka patra - *Calotropis procera* Ait R.Br
2. Saindhava lavana – Rock salt

Review of Arka patra¹⁶⁻¹⁸

Arka patra are the leaves of plant *Calotropis procera*. It is a sacred plant to many Hindus. It is regarded as useful medicinal herb and used in folk medicine. The leaves of *Calotropis procera* i.e Arka patra (sun leaf) have been associated with sun worship. It is a small, erect and compact shrubs 1-2 m high, often found as a weed throughout India in more or less warm dry places.

Arka(*Calotropis procera* Ait R.Br)

Latin Name - *Calotropis procera* (Ait R. Br)

Family - *Asclepiadaceae*

Types

- a) Shwetarka - *Calotropis gigantea* (Linn) R.Br Ait.

- b) Raktarka - *Calotropis procera* (Ait) R.Br.

Gana

- a) Charak - Swedopaga, Bhedaniya, Vamanopaga.
- b) Sushrut - Adhobhaghara, Arkadi.

Vernacular Name

- a) Sanskrit: Raktarka, Arkaparna, Kshiraparna, Arkanama, Vikirana, Shuklaphala, Toolaphala.
- b) Marathi: Rui
- c) Hindi: Aak, Madar
- d) English: Madar

Classification

- a) Ayurved: Akritrim, Sthavara visha, Vanaspatija Upavisha
- b) Modern: Irritant, Organic, Vegetative poison

Rasa -Katu, Tikta

Guna - Laghu, Ruksha, Tikshna

Virya - Ushna

Vipaka - Katu

Doshagnata - Kaphavatashamaka

Arka patra finds a broad usage in various pharmaceutical procedures of Ras shastra and Bhaishajya Kalpana that includes Shodhana, Marana, Bhasmikaran and many Ayurvedic formulations.

Table 2: Properties and Action of Arka patra¹⁹

Rasadipanchak	Arka patra
Rasa	Katu, Tikta
Guna	Tikshna, Sara
Virya	Ushna
Vipaka	Katu
Doshagnata	Kapha, Vata
Karma	Vatahara, Dipana, Krimighna, Shopha, Vranahara, Vishaghna, Bhedana, Shwashara
Therapeutic Uses	Shotha, Kandu, Vrana, Krimirog, Gulma, Sleshmodara roga, Pliharoga, Arsha, Shwasa.
Dose	250-750mg of the drug in powder form

Nearly 25 formulations were found where Arka patra has been indicated in management of Kustha, Karnavyadhi, Gulma, Arsha, Udavarta, Pliha, Yakritroga.

Table 3: Formulations of Arka patra²⁰⁻²⁶

Sr. No	Single content/Formulation	Dosage form	Indications	References
1	Arka patra Swaras	Swaras	Karnashool	BBR Kalp 30
2	Arka swaras	Swaras	Karnavyadhi	YR Karna roga adhikar, verse 38.
3	Arkapatrasara tail	Tail	Pama, Vicharchika, Kacchu	BBR Kalp 186
4	Agnikumara Rasa	Gutika	Jwara	RYS Kalp 166
5	Arka Kshara	Kshara	Arsha	BBR Kalp 78

6	Arkadi Taila	Tail	Khalli, Pakshaghat Grudhrasi, Visuchika	BBR Kalp 187
7	Arkeshwara Rasa (pancham)	Gutika	Arsha	RYS Kalp 932
8	Arogya Lavana	Vati	Gulma	BBR Kalp 9029
9	Bhasmarak churna	Churna	Udara	GN 295-305
10	Bibhitaka churna	Churna	Kasa	BBR Kalp 4624
11	Brihat icchabhedi rasa	Gutika	Udavarta	BRS Udavarta anaha adhikar
12	Kalpataru rasa	Gutika	Kshaya	RYS Kalp 477-487
13	Nirgundyadi taila	Tail	Karnabadhira	YR Karnarogachikitsa verse 52
14	Panchanan jvarankusha	Gutika	Jwara	BBR Kalp 4275
15	Paribhadrakavaleha	Avaleha	Krimi	BR 11/64-70
16	Rajikadi gutika	Gutika	Shwasa	BBR Kalp 5929
17	Saindhavadi taila	Tail	Karnavyadhi	YR Karnavyadhi verse 53
18	Sarveshvar Rasa	Gutika	Kushtha	BR 54/163-168
19	Shitari rasa	Vati	Vatavyadhi	BBR Kalp 7642
20	Snuhyadi lepa	Lepa	Kustha	VS verse 64-70
21	Suranadi Yoga	Churna	Arsha	BBR Kalp 1863
22	Tampra parpati	Parpati	Kasa	YR Kasadhya verse 149-155
23	Tamreshwar Vati	Vati	Pliha	BRS Pliharogadhikar
24	Tamreshwar Vati	Vati	Udara	RYS Kalp 56
25	Vajra Kshara	Kshara	Yakrudalyaudara	BBR Kalp 6589

*BBR – Bharat Bhaishajya Ratnakar, YR – Yogaratnakar, RYS – Rasayogsagar, GN - Gada Nigraha, BR – Bhaishajya Ratnavali, VS – Vangasena, BRS - Brihat Rasaraj Sundar

Phytochemical Constituents²⁷⁻²⁸

Phytochemical screening reveals the presence of Alkaloids, Glycosides, Tannins, Steroids, Cardenolides, Terpenoids, Saponins, Flavonoids, Phenols, Sugars, Carbohydrates, Ascorbic acid, Orthopyrocatechic acid, Taxasterol, Tarasterol, tetraxasteryl acetate β -sitosterol, Calotropagenin, Calotropin, Calotoxin,

Calactin, α -Amyrin, β -Amyrin, Stigmasterol, Calotropenyl acetate, Calotropenol, Procesterol, Uscharin, Uscharidin, Voruscharin, Syriogenin, Multiflorenol, 12 β -Hydroxyfrugoside, 4'-O- β Glucopyranosyl -12 β -Hydroxyfrugoside, 4'-O- β Cellobiosyl-12 β -Hydroxyfrugoside, 16 α -Hydroxy calotropagenin, Urosolic acid, o- Pyrocatechuic acid. Most active principle found in leaves is Mudarin with yellow bitter acid, resin.

Table 4: Phyto-constituents of Arka patra and their biological activities²⁹⁻³¹

Phytoconstituents	Biological activities
α amyrin	Anti-oxidant, Analgesic, Anti-inflammatory, Antitumor, Antiulcer, Cytotoxic, Gastroprotective, Hepatoprotective.
β amyrin	Anti-oxidant, Analgesic, Anti-inflammatory, Antiulcer, Gastroprotective, Hepatoprotective.
β sitosterol	Antioxidant, Anorexic, Antibacterial, Anticancer, Antifertility, Antifeedant, Anti-inflammatory, Antihyperlipoproteinaemic, Antileukemic, Antilymphomic, Antimutagenic, Antitumor, Antiviral, Antipyretic, Hepatoprotective, Hypoglycemic, Hypolipidemic, Ulcerogenic.
Stigmasterol	Antioxidant, Antinociceptive, Antiviral, Cancer-preventive, Hypocholesterolemic, Sedative.
Calotropin	Antitumor, Cardioactive, Proteolytic
Calactin	Cardioactive
Calotoxin	Cardioactive

Pharmacological Activities of *Calotropis procera*

Calotropis procera leaves has been extensively studied for different biological activities through *in vitro*, *in vivo* and clinical studies.

Table 5: Studies carried out on leaves of *Calotropis procera*³²⁻⁴²

Sr. No	Study type	Activities studied	Extract	Cell line / Animals	Assessment	Outcome
1	In vitro	Anthelmintic	i. Ethanol ii. n- butanol iii. water iv. n- hexane v. chloroform vi. chloroform: methanol (9:1)	<i>Pheretima postuma</i>	Anthelmintic assay	Ethanol extract, water fraction, n-hexane and chloroform elute shows Anthelmintic activity.
2	In vitro	Antispasmodic	Ethanol	Rat colon	-	Ethanol extract shows antispasmodic effect on the gastrointestinal smooth muscles of rat colon.
3	In vitro	Cytotoxicity	i. Chloroform ii. Chloroform: methanol (9:1) iii. Chloroform: methanol (7:1) iv. Chloroform methanol (1:1)	Human Hepatoma cell line (HEPG2)	SRB assay	Chloroform: methanol (9:1) elute has anticancer potential.

			v. Methanol			
4	In vitro	Cytotoxic effect	Methanol	Breast Cancer Cell Line T47D	MTT assay	Methanolic fraction proved effective against the proliferation of breast cancer cell line T47D.
5	In vitro	Antioxidant	Methanol	-	DPPH free radical scavenging activity	Methanolic extract shows significant antioxidant activity.
6	In vitro	Antibacterial	Methanol	-	Antibacterial assay	Methanol extract was highly active against <i>Proteus mirabilis</i> , <i>Bacillus cereus</i> , <i>Pseudomonas aeruginosa</i>
7	In vivo	Antidiarrhoeal	Methanol extract	Albino mice	-	Methanol extract shows significant Antidiarrhoeal activity.
8	In vivo	Anti - Hyperglycaemic effect	Hydroalcoholic extract	1.Male wistar rats 2.Swiss mice	1.Acute toxicity 2.Oral glucose tolerance test	The hydroalcoholic extract has antihyperglycemic effect in streptozotocin induced diabetic rats.
9	In vivo	Anti-Inflammatory Analgesic Activities	Ethanollic	1.Wistar rats 2.Swiss mice	Anti-inflammatory study 1.Carrageenan induced paw oedema in rats 2. Formalin paw lick test in rats. Analgesic study 1.Acetic acid writhing response in mice 2. Tail flick test.	Ethanollic extract shows potent anti -inflammatory and analgesic properties.
10	In vivo	Anti - hyperbilirubemic and wound healing	Aqueous extract	Wistar rats	-	AECP showed significant bilirubin Lowering and wound healing property in Wistar rats.
11	Clinical	Karnashool with Special Reference to Diffuse Otitis Externa	Arkapatra swaras	60 patients	1. Diagnostic phase 2.Intervention phase 3. Assessment phase	In Trial group – 86.67% patients got relief and in control 90% patients got relief from karnashool.

Review of Saindhava lavana

Saindhava Lavana is included in ‘Trilavana, Panchalavana, Shadlavana,’ by various Acharya in Bruhatrayi, Laghutrayi, Nighantu and in ancient texts of Rasashastra. ‘Ras Ratna Samuchchaya’ has mentioned Saindhava lavana in Vishaghna

Gana. It is one of the ingredients in many ayurvedic formulations taken internally and externally. It is used in many ‘Lavana Kalpana’ among which, one of the kalpana is ‘Arka lavana’. It is a mineral which is obtained from mines near Sindhu River in Punjab state and so, Saindhava is also known as ‘Sindhuka’.

Table 6: Saindhava lavana⁴³

1	Latin Name	<i>Sodii chloridum</i>
2	Types	a) Shwetavarna b) Raktavarna
3	Vernacular Names	a) Sanskrit: Sheetshiva, Manimantha, Sindhuja, Sindhutha, Sindhudeshja, Shiva, Nadeya. b) Marathi: Shende Mitha. c) Hindi: Sendha Namak. d) English: Chloride of sodium, Rock salt, Bay salt
4	Rasa	Madhura, Lavana.
5	Guna	Laghu, Snigdha, Vishyandi, Sukshma
6	Virya	Sheeta
7	Doshakarma	Tridoshashamaka
8	Pharmacological action	Deepana, Pachana, Rochana, Chakshusya, Avidahi, Vrushya, Hrudya.
9	Indications	Udarshool, Ajirna, Vibandhajeet, Vranadosharana, Hrudroga.

DISCUSSION

Arka lavana is the formulation which is safe and effective and noteworthy compound formulation of Arka patra and Saindhava lavana. A number of references for internal administration of Arka lavana is found in classics like Rasatarangini, Bhaishajya ratnavali, Ayurvedsara sangraha, Siddha bhaishajya sangraha, Vangasen, Gadanighraha etc. Components of this formulation, Arka patra and Saindhava lavana are easily available and cheap. Also, this formulation is easy to prepare and easy to administer.

Several Anupana and Matra are mentioned in accordance with the indications. With the change of Anupana and Matra drug's administration, companion, delivery, interaction, bioavailability changes and its absorption promote with most of the active ingredients. In literature review, mode of action of Arka lavana is not described. Hence its probable mode of action is derived owing to action of its ingredients.

On surveying the literature, it is found that Arka lavana is mainly prescribed in Gulma, Udara and Yakrit-pleeha roga. The basic

etiology of Gulma, Udara, Yakrit-Pleeha roga is Agnimandya. Its principal management consist of administration of Deepana and Pachana dravya. Arka patra possess Katu rasa and Katu vipaka which acts as Agnivardhaka, Tikta rasa exhibits Deepana Pachana karma. Ushna virya helps to pacify Kapha Vata dosha. Saindhava lavana possess Lavana rasa which shows both Deepana and Pachana karma. Deepana karma helps to aggravates Agni whereas Pachana karma strengthens Jatharagni to do Amapachana. So, by virtue of these properties, the compound formulation helps in stimulating Jatharagni as well as Dhatwagni by expelling vitiated dosha. Also, Arka patra shows Sara, Bhedhana, Tikshna guna, Shophahar, Vranahara, Vishaghna and Kaphavatashamak karma which helps to treat Gulma, Yakrit, Pleeha and Udara roga. Saindhava lavana owing to its Sukshma property supports this formulation to easily penetrate into the minute channels of Srotas and enhance its absorption.

Gulma encompasses a clinical condition from abdominal distention to malignant growth. Yakrit-pleeha vikara (liver and spleen diseases) are included in Udara rogas by Ayurveda. Phytochemical constituents of *Calotropis procera* leaves like α amyryn, β amyryn, β sitosterol, Stigmasterol etc most commonly shows antioxidant, cytotoxic, anti-inflammatory, analgesic, antitumour, hepatoprotective activities etc. As given in table no 5, preclinical studies conducted has proven these activities. Studies have indicated that antioxidants can be employed efficiently as chemo preventives and as effective inhibitors of cell proliferation, promoting cell apoptosis and increasing detoxification enzymes and inhibiting gene expression and scavenger Reactive oxygen species (ROS). These antioxidant phytochemicals act as hepatoprotective agents. Previous research work has proven the Hepatoprotective activity of Arka lavana.

Arka lavana which consist of Arka patra carries same phytoconstituents which exerts many pharmacological effects used in management of Gulma, Udara, Yakrit-pleeha roga. Thus, mode of action of Arka lavana is derived owing to its ingredients i.e. Arka patra and Saindhava lavana. Agnisamskara makes Arka lavana more absorbable, colloidal, easy to assimilate and shows greater efficacy in low dose. Also, it imbibes properties like Doshahara, Gunaprakarsha, Dipana, Laghutva, Shighravayapti etc. along with original properties of ingredients. Hence by using various doses and Anupana, Arka lavana helps in management of disease conditions like Gulma, Yakrit, Pleeha and Udara roga.

CONCLUSION

From the above review, it is stated that Arka lavana is effective drug indicated in various disease conditions. By subjecting Arka patra and Saindhava lavana to Putapaka, Agnisamskara enhances their guna making Arka lavana as a potent drug effective in low dose. The pharmacological activities that have been reported for Arka patra and Saindhava lavana helps to validate the therapeutic claims of Arka lavana. Hence it is concluded that mode of action of Arka lavana is similar to the combined action of Arka patra (*Calotropis procera*) and Saindhava lavana. Further there is need to conduct the preclinical and clinical trials of Arka lavana to support its pharmacological activities like Anticancer, Antioxidant, Anti-inflammatory etc.

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