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## Exploring the hidden potential of Arka (*Calotropis procera* Linn. & *Calotropis gigantea* Linn.), an Upavisha in the field of toxicology

**Dr. Rukma CK, Dr. Shanti R Nair, Dr. Divya KM and Dr. Ittoop J Ancheril**

### Abstract


In *Ayurveda*, *Upavisha* are the group of drugs which are less toxic in nature and not so lethal but produces toxic symptoms on contact or on consumption. *Arka* is a well-known medicinal plant in Indian system of medicine and also it is one among the *Upavishas*. According to *Charaka Acharya*, Even an acute poison can become an excellent medicine if administered properly & On other hand even most useful medicine can act like a poison if handled incorrectly. Unique methodology of using semi-poisonous plants in treatment has shown good outcome in therapeutics. The drug *Arka* is an important ingredient of various classical *vishahara yogas* in clinical practice since ages. It is included under *Bhedaniya (Vagbhata) Vamanopaga, Svedopaga (Charaka), Arkadi, Adhobhagahara Gana (Susruta)* and also included under *Guduchyadi Osadhi varga (Bhavaprakash)*. This review article includes overall information about plant *Arka*, it's Botanical description, toxicological aspect, management, medico-legal aspect and therapeutic traditional uses and *Arka* containing *Agada yogas* mentioned in *Keraleeya Visha Vaidya Granthas*.

**Keywords:** *Arka, Arka Ksheera, Upavisha, Prativisha, Calotropis, Agada yogas.*

### Introduction

*Arka (Calotropis gigantea linn.)* is one of the plants classified under semi-poisonous category termed as *Upavisha*. *Upavisha* are the group of drugs which are less toxic in nature and not so lethal but they produce certain toxic symptoms on contact or on consumption. They are having low potency <sup>[1]</sup>. Even an acute poison can become an excellent medicine if administered properly & On other hand even most useful medicine can act like a poison if handled incorrectly <sup>[2]</sup>. *Arka* is one among the *Ekadasha Upavisha* <sup>[3]</sup>. It is one of the *Sapta Upavisha* <sup>[4]</sup>. Some mention it as one of the *Nava Upavisha* <sup>[5]</sup>. Some of the synonyms of *Arka* are *mandara, vasuka, sada puspa, alarka & pratapasa*. *Arka* is said to have 2 types i.e. *Alarka/Sweta Arka* and *Arka* (based on floral colours) which are botanically white variety of *Calotropis procera* and purple variety of *Calotropis gigantea* respectively <sup>[6]</sup>.

Scientific Classification	
Kingdom	Plantae
(unranked)	Angiosperms
(unranked)	Eudicots
(unranked)	Asterids
Order:	Gentianales
Family:	Apocynaceae
Subfamily:	Asclepiadoideae
Tribe:	Asclepiadeae
Subtribe:	Asclepiadinae
Genus:	Calotropis

<p><b>Botanical name:</b> <i>Calotropis gigantea</i> linn.  <b>Family :</b> Asclepiadaceae  <b>Vernacular name</b> <sup>[4]</sup> :  <b>Sanskrit name :</b> <i>Arka</i>  <b>English name:</b> Madar  <b>Hindi name:</b> Madara  <b>Bengali name:</b> Aakondo  <b>Malayalam name:</b> Errikke  <b>Classification:</b>  <b>Ayurveda :</b> <i>Sthavara visha varga, Upavisha</i>  <b>Modern :</b> Irritant organic vegetative poison  <b>Special Categorisation</b> <sup>[5]</sup>:  <b>Charaka:</b> <i>Bhedaneeya, Vamanopaga, Swedopaga, Kseera traya</i>  <b>Susruta:</b> <i>Arkadi, Adhobhagahara</i>  <b>Vagbhata:</b> <i>Arkadi</i></p>	
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**Distribution:** Calotropis grows all over India, especially in the warm areas, deserts and wasteland. It grows on rubbish heaps, by the roadside and in sand dunes.

**Plant description:** It is a tall shrub with yellowish white bark, oblong thick leaves and purplish/white flowers. Fruits are long, curved which break open on drying. It gets automatically perforated and soft cotton comes out. It has seeds which are spread everywhere by wind flow. Seeds are small black in colour. When stem, branches & leaves are cut, crushed or incised, it yields thick, acrid milky white latex called Arka ksheera (madar juice). The juice forms into a white clot or coagulum leaving a clear straw coloured serum after it is heated or allowed to stand for few hours. The coagulum yields a yellowish brown resin and a snow-white crystalline substance having formula C<sub>27</sub>H<sub>46</sub>O<sub>2</sub> <sup>[7]</sup>.

**Flowering and Fruiting time:** Flowering occurs in spring and Fruiting during summer.

**Major Chemical Constituent** <sup>[8]</sup>: Calotoxin, Calotropin, Calactin, Uscharin.

Arka kseera contains all these constituents along with Trypsin.

**Toxic part used:** Root, stem, leaves, latex.

**Fatal dose:** uncertain

**Fatal period:** ½ - 8 hrs.

Four Varieties according to Raja Nighantu. Arka, Sveta arka, Raja arka, Sveta mandaraka

**Ayurvedic Properties** <sup>[9]</sup>

Rasa – Katu, Tikta

Guna- Laghu, Ruksha, Tiksna

Virya- Usna

Vipaka- Katu

Karma-Vatahara, Rechana, Vishaghna, Dipana, Param Sodhana.

**Indications:** Visha roga, Visarpa, Udara, Gulma, Krimi, Kandu, Kustha, Vrana, Gulma, Medo roga, Udara, Arsas, Sopha, Pleeha.

**Arka- Therapeutic Uses** <sup>[10]</sup>

**Krimidanta sula:** Cotton piece is dipped in mixture of equal parts of Arka ksheera & Honey and placed over affected area.

**Mukha ksata:** Mixture of Arka ksheera (1 part) and Honey (3 parts) to relieve local pain and inflammation in stomatitis.

**Arsas:** Mixture of Arka ksheera, haridra choorna (*Curcuma longa* linn.) & Sireesha bija choorna (*Albizia lebbek* linn.) is applied over the affected part in chronic pile masses.

**Snake bites:** Arka leaves are given to chew in snake bite cases

**Lootha visha** <sup>[11]</sup>: Sireesha beeja is done Bhavana with Arka Ksheera 3 times, mixed with Pippali Choorna (*Piper longum* linn.) and given for Lepa, Pana, Nasya & Anjana 11.

**Vrischika Visha** <sup>[12]</sup>: Lepa with Palasha beeja (*Butea monosperma* Linn.) mixed with Arka ksheera relieves pain due to scorpion bite.

**Alarka Visha:** Intake of combination of Arka ksheera, Palala, Taila & Guda.

**Table 1:** Arka containing AGADA YOGAS mentioned in some of the classics.

Sl no.	Agada yogas	Indications	Parts used	Reference
1	<i>Kshara Agada</i> <sup>[13]</sup>	<i>Sarva vishahara, Dundhubhi pataaka alepana, takshaka darpa nashana.</i>	<i>Arka bhasma</i>	<i>S.S.</i>
2	<i>Mahasugandhi Agada</i> <sup>[14]</sup>	<i>Sarva vishahara</i>	<i>Arka puspa</i>	<i>S.S.</i>
3	<i>Ekasara Gana</i> <sup>[15]</sup>	<i>Sarva vishaghna</i>	<i>Arka puspa</i>	<i>S.S.</i>
4	<i>Sarvakarmika Agada</i> <sup>[16]</sup>	<i>Vyantara visha</i>	<i>Arka puspa</i>	<i>A.S.</i>
5	<i>Mrtasanjeevana Ghrta</i> <sup>[17]</sup>	<i>Gara visha, Sarva vishaghna Sanjeevanam in visha-odvandha mrtas</i>	<i>Arka mula</i>	<i>A.S.</i>
6	<i>Sanjeevana Agada</i> <sup>[18]</sup>	<i>Gara visha, Jeevanam to visha-supta.</i>	<i>Arka puspa</i>	<i>A.S.</i>
7	<i>Amrta Ghrta</i> <sup>[19]</sup>	<i>Sarva vishaghna, Sanjeevanam in visha-odvandha mrtas</i>	<i>Arka mula</i>	<i>C.S.</i>
8	<i>Kapitthadi yoga</i> <sup>[20]</sup>	<i>Grha godha visha</i>	<i>Arka beeja</i>	<i>C.S.</i>
9	<i>Kapotavitaadi yoga</i> <sup>[21]</sup>	<i>Vrischika damsha</i>	<i>Arka ksheera</i>	<i>C.S.</i>

10	<i>Jeevaraksha gulika</i> [22]	<i>Sarpa visha</i>	<i>Sveta Arka ksheera</i>	<i>P.S.</i>
11	<i>Sveta Arkamulaadi yoga</i> [23]	<i>Sarpa visha, Revival of visha mohita</i>	<i>Sveta Arka mula</i>	<i>P.S.</i>
12	<i>Mrtyunjaya gulika</i> [24]	<i>Sarva vishaghna</i>	<i>Arka ksheera</i>	<i>V.V.J.</i>
13	<i>Devadaaryadi yoga</i> [25]	<i>Sarva vishaghna</i>	<i>Arka mula</i>	<i>V.V.J.</i>
14	<i>Mayoorshikhaadi Dhoopana Yoga</i> [26]	<i>Sarva mahavishaghna</i>	<i>Arka Cotton</i>	<i>V.V.J.</i>

[S.S.= *Susruta Samhita*, A.S.=*Astanga Sangraha*, C.S.=*Charaka Samhita*, P.S.= *Prayoga Sammuchaya*, V.V.J.=*Visha Vaidya Jyotsnika*]

### Arka ksheera Shodhana [27]

To purify *Arka ksheera*, *Tila* (*Sesamum indicum* Linn.) is fried and put into it. Either 2 or 3 among the following combination of *Ela*, *Maricha*, *Nagahwa* & *Pippali* is fried and put into *Arka Ksheera*.

*Arka ksheera* is coming under *Dugdha varga* and is abundantly used in mercurial operations [28]. They opine that *Arka Ksheera* is pure by itself and needs no purification [29]. Some suggest the same *Sodhana vidhi* (Purification method) as that of *Snuhi ksheera* (*Euphorbia nerifolia* Linn.) can be applied [30]

### Arka ksheera properties [31]

*Arka ksheera* is having *Tikta rasa* and *Laghu, Snigdha, Usna guna*. It is useful in *Kustha, Gulma, Udara* and is *Srestha Virechana Aushadha*. It also induces *Vamana*. It pacifies chronic Pile masses & mitigates *Krimidanta sula*. When applied on skin it has a *Kshara* action.

### Formulations of Arka [32]

*Arka lavana, Arka vati, Arka tailam, Ravimuladi vati, Adraka ghrta, Mahavishagarbha tailam, Vajraka tailam, Prabhanjana vimardhana Tailam, Marichadi tailam, Shankha vati, Kshara gulika, Kalyanaka lavana, Trailokya Chintamani Rasa.*

### Toxic Symptoms [33]

**Orally:** Madar juice is bitter in taste. Produces burning pain in throat & stomach. Followed by salivation, stomatitis, diarrhoea, vomiting. Pupils are dilated along with tetanic convulsions, collapse and death. Sometimes delirium may occur.

**Locally:** Skin Contact- Madar juice produces redness, inflammation & vesication. Can give rise to skin lesions resembling "Fabricated Injuries".

Eye Contact-Severe Conjunctivitis or dimness of vision or Blindness.

**Internally:** GIT Irritation and acts as Cerebro-spinal poison. Death occurs if madar root powder is used as snuff.

### Treatment in Classics

1. *Moola vishapeeda* treatment ie. Intake of combination of *Rajani* (*Curcuma longa* Linn.) *Saindhava* (rock salt), honey and ghee can be done [34].
2. *Sthavara visha* treatment ie. *Sheetha Jala dhara*, Intake of honey with ghee and *Virechana* can be induced as fast as possible. Or intake of cow's milk with sugar in plenty. Or frequent intake of *Karuparuthi puspa* (*Gossypium herbaceum* Linn) *Swarasa* mixed with sugar [35].
3. Following measures can be taken for poisoning due to *Arka ksheera* [36].
  - a. Intake of *Tila* (*Sesamum indicum* Linn.) *kashaya* with *guda*.
  - b. Intake of *Trvrt* (*Operculina turpethum* Linn) with

*saindhava*.

- c. Intake of Curry leaves (*Murraya koenigii* Linn.) with buttermilk/gingelly oil.
- d. Intake of *Karuparuthi* (*Gossypium herbaceum* linn) leaf made paste with rice wash along with *Tila* & *guda*.

### Antidotes

For *Arka ksheera*, some of the antidotes are sugar solution, fresh leaf juice of *Neeli*, diluted leaf juice of tamarind and Castor oil.

### Post-mortem signs [37]

Froth at nostrils, dilated pupils, stomatitis and inflammatory changes of GIT with ulceration. Stomach may show perforation. All viscera including brain shows congestion.

### Medico-legal Aspect [38]

*Calotropis procera* root is a powerful poison for cobras & other poisonous snakes which cannot stand its' smell. Madar juice is occasionally used for purposes of Suicide, Infanticide & homicide. Madar juice used by tanners for removing hair from skin, which also imparts a yellow colour to skin & destroys offensive odour of fresh leather. Madar juice often used for procuring Criminal abortion by administering orally or introducing into uterus through Abortion stick. Madar juice sometimes used as a Cattle poison, either given with fodder or introduced into rectum of animal. Both the varieties of *Arka* plant are used for poisoning darts & arrows in Africa. Accidental poisoning may sometimes occur from an overdose of medicinal preparation of Madar administered by quacks.

### Discussion

Both *Sweta* & *Rakta Arka* are useful in medicinal preparations. But for *Vishaghna yogas*, white variety is more commonly used by traditional *Visha Vaidyas* of Kerala. Also studies have proved the analgesic, antivenom, anti-bacterial, anti-oxidant, anti-inflammatory activity, wound healing activity of white variety ie. *Calotropis gigantean* [39]. It is used in various disease conditions both internally as well as externally. Maximum formulations containing *Arka* is indicated in *Kaphagata rogas, Twak vikaras* and *Visha damshas*. Many ethno medicinal references are also available which suggests use of *Arka* as antidote in snake bite, scorpion bite & dogbite which is still practiced. Anti-fungal activity of latex suggests that *Arka* has a promising role in curing skin ailments. The anti-nociceptive activity & analgesic activities of dry latex have been proven [40]. *Arka* has anti-inflammatory, anti-pyretic, analgesic, wound healing & anti-bacterial action. All parts especially leaves are effective in Bronchial Asthma. *Kerala Visha Vaidya Granthas* have wide range of therapeutic applications with *Arka*. Due to *Teekshna Usna Virya, Katu Tikta Rasa* & *Katu Vipaka* such pharmacodynamics helping to combat action of *Visha*. ie. *Tadarthakaari Chikitsa* Also nothing is as effective as *Visha* (poison) to neutralize another poison, as it possesses *Sukshma*,

Vyavayi, Vikashi, Aashu, Laghu etc. properties which enables it to penetrate to *Sukshmatikushma Srotasa* and act very quickly.

### Conclusion

Plant based treatments and traditional medicine usage is gaining importance all over world. Plants belonging to the *Upavisha* group can give quick relief from various diseases and other toxicological conditions when used both externally & internally. Indian Acharyas have called *Arka Ksheera* as “*Vanaspatya parada*” or “Vegetable Mercury” due to its’ extensive application in mercurial operations. Many classical *Agada* preparations containing *Arka* are not practically in use in clinical practice and there remains a scope for research in this area.

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