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A Critical Review on *Arka Kalpana* (Distillate Formulations) for *Shwasa* (Asthma)

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ABSTRACT

Arka kalpana is one among the *Panchavidhakasaya kalpana* by *lankapati Ravna* and it is mentioned in detail in *Arka prakasha*. It is a classical text written in 16th century by *Lankapati Ravana* which deals primarily with different types of *Arkas* (formulations made by distillation) in the management of different diseases. There are 16 *Arka kalpana* mentioned in this book with *Shwasa* as one among their indications. *Shwasaroga* (Asthma) is the chronic conditions that affects the quality of life of the patient. Its symptoms are similar to Bronchial asthma. This review attempts to make a comprehensive compilation of *Arkas* indicated in *shwasa* and analyze their actions.

KEYWORDS

Arka Kalpana, Arka Prakasha, Shwasa, Asthma, Ayurveda



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INTRODUCTION

Arka kalpana is described as one of the *panchavidhakasaya kalpana* by *Lankapati Ravana*¹ and *Arka* is a liquid preparation obtained by distillation of certain liquids or of drugs soaked in water using the *Arka Yantra* (distillation apparatus)². The pharmaceutical aspect of *Arka kalpana* is mentioned in *Ravana's Arka Prakasha*. It is a classical text written in 16th century by *Lankapati Ravana*. There are 10 Chapters in the *Arka prakasha*, which are termed as *Shataka*. In the *thritiya shataka*, 16 *Arka* are indicated in *Shwasaroga*¹.

General method of *Arka* preparation:

The drug is coarsely powdered, if dry and crushed if wet, to soak it in sufficient quantity of water and kept overnight. Next day morning soaked drug is transferred to the *Arka yantra* and 10 parts of water added to it. The mixture is continuously heated till 60% of the distillate is collected. After cooling, the collected *Arka* is preserved in airtight bottles² or *Shwasa* means 'difficulty in breathing' – '*Shwasanaat Shwasaha*'³. *Shwasaroga* is one of the *pranavaha srota vikara*. The causative factors of *shwasa roga* are described as *raja* (Dust), *dhumavata* (Smoke-Wind), *shita sthana* (Cold water bath), *shita ambu* (Intake of cold water), *Vyayama* (Exercise)⁴. It is broadly divided into five types – *Kshudra*

Shwasa, *Maha Shwasa*, *Chinna Shwasa*, *Urdhva Shwasa* and *Tamaka Shwasa*⁵.

Asthma is defined as a chronic inflammatory disease of airway. And it is characterized by recurring symptoms, reversible airflow obstruction and bronchospasm. Symptoms include triad of dyspnea, Cough and Wheezing⁶.

Asthma is a very common disease with immense social impact. It occurs at all ages but predominantly in early life. According to the WHO, over 180,000 deaths worldwide are caused due to asthma annually. India, as of 2015, is the country with the highest number of deaths caused by respiratory causes. There has been an overall increase of incidence of respiratory disorders in India, prevalence of Bronchial Asthma is found around 100-150 millions of people. In India, it is about 15-20 millions of people that get affected by Asthma, among them 10- 15 % are noted for the children of age group 5-11 years old. The World-wide mortality rate is found to be increasing by 50 % in every decade⁷.

MATERIALS AND METHODS

Arka Kalpana's were enlisted given for *shwasa* from the *Arka prakasha*. Table (1) shows the list of *Arka Kalpana*¹. Detailed literature review of *Arka kalpana dravyas* were also compiled from



Ayurvedic literature, Journals and Internet media for the information regarding the *Arka kalpana dravyas*. The *Arka kalpana* having *shwasaghna karma* are listed below with their Reference and Botanical source, Family, Part used, *Rasa panchaka*, *Doshangnata* along with Research studies done on these *Arka kalpana dravyas*. Table (2) and (3) shows the Drug description and *Rasapanchaka* of *Arka kalpana dravyas*⁸.

OBSERVATION

In *Arka prakasha*, totally 10 chapters are mentioned. In *thrithiya shataka* 16 *Arka kalpana* mentioned as *Shwasagna karma*. All *Arka dravyas* contain mainly volatile principles which possess antioxidant, antiasthmatic, antitussive, anti-inflammatory, anthelmintic, anti-microbial, and anti-fungal activity. Among 16 *Arka*

kalpana dravyas, 13 drugs are have been proved as antiasthmatic activity on animal model and clinical trial.

Table1 List of *Arka Kalpana*

S.N	<i>Arka kalpana</i>	Chapter/Shloka no
01	<i>Shunti Arka</i>	3/3
02	<i>Pippali Arka</i>	¾
03	<i>Maricha Arka</i>	¾
04	<i>Dhanyaka Arka</i>	3/10
05	<i>Thumburu Arka</i>	3/18
06	<i>Pushkaramula Arka</i>	3/25
07	<i>Bharangi Arka</i>	3/29
08	<i>Prsna parni Arka</i>	3/30
09	<i>Aragwadha Arka</i>	3/32
10	<i>Guduchi Arka</i>	3/41
11	<i>Jivanti Arka</i>	3/45
12	<i>Hapusha Arka</i>	3/47
13	<i>Gunja Arka</i>	3/49
14	<i>Mesha shrungi Arka</i>	3/62
15	<i>Drona pushpi Arka</i>	3/82
16	<i>Katphala Arka</i>	3/92

Table 2 Drug description of *Arka kalpana dravyas*

S. N	Drug	Botanical name	Family name	Part used
01	<i>Shunti</i>	<i>Zingiberofficinale</i> Roscoe.	Zingiberaceae	<i>Kanda</i>
02	<i>Pippali</i>	<i>Piper longum</i> Linn.	Piperaceae	<i>Phala</i>
03	<i>Maricha</i>	<i>Piper nigrum</i> Linn.	Piperaceae	<i>Phala</i>
04	<i>Dhanyaka</i>	<i>Coriandrum sativum</i> Linn.	Apiaceae	<i>Phala</i>
05	<i>Thumburu</i>	<i>Zanthoxylum alatum</i> Roxb.	Rutaceaea	<i>Phala</i>
06	<i>Pushkaramula</i>	<i>Inula racemosa</i> Hook.f.	Asteraceae	<i>Mula</i>
07	<i>Bharangi</i>	<i>Clerodendron serratum</i> Linn.	Verbenaceae	<i>Mula</i>
08	<i>Prsna Parni</i>	<i>Uraria picta</i> Desv.	Papillionaceae	<i>Mula</i>
09	<i>Aragwadha</i>	<i>Cassia fistula</i> Linn.	Caesalpinaceae	<i>Phala</i>
10	<i>Guduchi</i>	<i>Tinospora cordifolia</i> Linn.	Menispermaceae	<i>Kanda</i>
11	<i>Jivanti</i>	<i>Leptadenia reticulate</i> Retz.	Ascalepidaceae	<i>Patra</i>
12	<i>Hapusha</i>	<i>Juniperus communis</i> Linn.	Pinaceae	<i>Twak</i>
13	<i>Gunja</i>	<i>Abrus precatorius</i> Linn.	Leguminoseae	<i>Beeja</i>
14	<i>Mesha Shrungi</i>	<i>Gymnema sylvestre</i> R.Br.	Ascalepidaceae	<i>Patra</i>
15	<i>Drona Pushpin</i>	<i>Leucas aspera</i> Willd.	Lamiaceae	<i>Pancanga</i>
16	<i>Katphala</i>	<i>Myrica nagi</i> Linn.	Myricaceae	<i>Kanda twak</i>

Table 3 *Rasapanchaka* of *Arka kalpana dravyas*



S.N	Dravya	Rasa	Guna	Virya	Vipaka	Doshagnata
01	Shunti	Katu	Guru, Ruksha, Tiksha	Usna	Katu	Kaphavatasamaka
02	Pippali	Katu	Tikshna, Laghu, Snigdha	Anusna	Madhura	Kaphavatasamaka
03	Maricha	Katu	Tikshna, Laghu	Usna	Katu	Kaphavatasamaka
04	Dhanyaka	Katu, Tikta, Kasaya, Madhura	Snigdha, Laghu	Usna	Madhura	Tridoshasamaka
05	Thumburu	Katu, Tikta	Laghu, Ruksha, Tikshna	Usna	Katu	Vatakaphasamaka
06	Pushkaramula	Katu, Tikta	Tikshna, Laghu	Usna	Katu	Vatakaphasamaka
07	Bharangi	Katu, Tikta, Kasaya	Ruksha, Laghu	Usna	Katu	Kaphavatasamaka
08	Prsnaparni	Madhura, Katu	Laghu, Sara	Usna	Madhura	Tridosasamaka
09	Aragwadha	Madhura, Tikta	Guru, Snigdha	Sita	Madhura	Vatapittasamaka
10	Guduchi	Tikta, Kasaya	Laghu, Guru, Snigdha	Ushna	Madhura	Tridosasamaka
11	Jivanti	Madhura	Snigdha, Laghu	Sita	Madhura	Tridosasamaka
12	Hapusha	Katu, Tikta	Laghu, Ruksha, Tikshna	Ushna	Katu	Kaphavatsamaka
13	Gunja	Tikta, Kashaya	Tikshna, Laghu, Ruksha	Usna	Katu	Kaphavatahamaka
14	Meshashrunji	Tikta, Kasaya	Laghu, Ruksha	Usna	Katu	Kaphavatasamaka
15	Dronapushpi	Katu, Lavana	Guru, Ruksha, Tikshna	Usna	Madhura	Vatakaphasamaka
16	Katphala	Kashaya, Tikta	Laghu, Tikshna	Ushna	Katu	Vatapittasamaka

Enumeration of Drugs with their Experimental /clinical study

Shunthi: (*Zingiber officinale* Roscoe.)

Shunthi is perennial herb with elongated leafy stems and leaves sessile, linear-lanceolate, acute or acuminate. Rhizome is stout and tuberous⁹. Gingerol, Zingerberenes, Zingiberol, Shogaol, isoproterenol, Essential oils are those which act on respiratory system. A clinical study reveals that 5ml of *Ardraka* arka nebulization reduces the chest tightness along with good expectoration and a reduction the intensity of ronchi and good broncho dilatation effect was found less than 20 minutes in reduction of symptoms and increase of PEFr whereas the changes were seen after 40 minutes

when one pala (48ml) of *Arka* administered internally¹⁰.

Pippali: (*Piper longum* Linn.)

Pippali is a slender aromatic Perennial climber with woody roots and creeping stem with ovate, cordate leaves. Fruits are ovoid, Yellowish orange, sunk in fleshy spike¹¹. The essential oil of the fruit *P. longum* is a complex mixture, the three major components of which are caryophyllene, pentadecane and bisabolone, others include thujine, terpinoline, zingiberine, p-cymene and p-methoxy acetophenone which act on Respiratory system¹². The extract of *P. longum* in milk reduced passive cutaneous anaphylaxis in rats and protected guinea pigs against antigen-induced bronchospasm¹³.



Maricha: (*Piper nigrum* Linn.)

It is a branched climbing shrub, rooting at the nodes, leaves are simple, alternate, cordate, fruits are ovoid or globose. Essential oil found to be thujene, dl-limonene, terpinene, dihydrocarveol, pinene, sabinene, myrcene, cymene, caryophyllene, and used as anti-pyretic, anti-oxidant, cough and asthma¹⁴.

The aqueous extract of *Piper nigrum* fruits significantly inhibited acetylcholine induced bronchoconstriction of isolated goat trachea which revealed anti-asthmatic potential¹⁵.

Dhanyaka: (*Coriandrum sativum* Linn.)

It is an aromatic, herbaceous annual, leaves pinnately or ternately decomposed, Fruits yellowish brown, globose, separating in to two halves and seeds compressed. And anti-bacterial, anti-fungal, anti-microbial, insecticidal activity, anti-oxidant activity reported from essential oil¹⁶.

The essential oil from seed is linalool (60% Y80%) followed by other alcohols, ketones and esters such as >-pinene (0.2% Y8%), F-terpinene (1% Y8%), geranyl acetate (0.1% Y4.7%) and camphor¹⁷.

Tumburu: (*Zanthoxylum alatum* Roxb.)

A Small tree, flattened prickles on trunk, bark pale brown, furrowed, leaves unequally pinnate, lanceolate, flowers small yellow in colour¹⁸.

The major essential oil constituents such as 3-borneol, isobornyl acetate, dihydrocarveol, linalool, α -limonene diepoxide, α -pinene and geraniol. And anticonvulsive, antinociceptive, anti – bacterial, antifungal and antispasmodic activity reported from essential oil.

The essential oil of *Z. armatum* provides evidence as bronchodilator and antiasthmatic properties in histamine and OVA-induced allergens in guinea pigs and mice¹⁹.

Pushkaramoola: (*Inula racemosa* Hook.f.)

A stout herb with rough grooved stem, leaves simple, alternate, radicle or cauline, root is brownish externally and white internally, on drying it becomes greyish and it is aromatic and irregularly wrinkled²⁰. Root contains inulin (10%) and an essential oil (1.3%) containing alantolactone. And essential was found anti-microbial, anti-fungal and anthelmintic activity²¹.

Extract of dried roots of *Inula racemosa* revealed antiasthmatic activity as noticed by antagonistic effect on histamine induced contraction, milk- induced eosinophilia and leukocytosis, and protection against mast cell degranulation²².

Bharangi: (*Clerodendron serratum* Linn.)

Bharnagi is a shrub with Leaves opposite, acute and usually coarsely and sharply serrate. The roots are used as Anti-inflammatory, Anti-spasmodic, Cough and



Asthma etc²³. Essential oil was found serratin and lupeol²¹. A clinical study reveals that 5ml of *Bharangi arka* nebulization was effective in *vegaavastha* of *Tamaka shwasa* immediately after administration²⁴. The anaphylactic bronchoconstrictor response in sensitized isolated guinea pig lung was found to be inhibited after continuous perfusion of the alcoholic fraction of aqueous extract of the root of *Clerodendrum serratum* suggesting antiasthmatic potential²⁵.

Prisnaparni: (*Uraria picta* Desv.) A suffruticose herb or undershrub, woody with leaves imparipinnate, lanceolate, acute and blotched with white. Flowers are pink or purple and seed ovate light brown, reniform²⁶. Alkaloids, triterpenes, Saponin, flavonoids and steroids were isolated from the root of *Uraria picta*, shows anti-microbial and analgesic activity²⁷.

Aragvadha: (*Cassia fistula* Linn.) *Aragvadha* is a moderate sized deciduous tree, Leaves pinnately compound, ovate, acute, bright green glabrous above and slightly pubescent beneath and said to be antitussive, antipyretic, anti-inflammatory and analgesic etc²⁸. Essential oils found to be aldehydes, eugenol and pinene²⁹. saponins and saponinins was found to be effective against asthma and its Cf-3 active fraction at 150 mg/kg body weight with

Acacia gum showed 78.35±1.29% intact mast cells and 21.65±1.34 % disrupted mast cells during mast cells de-granulation process³⁰.

Guduchi: (*Tinospora cordifolia* Linn.) *Guduchi* is a Climbing Shrub, Leaves Cordate, Flowers are Greenish- yellow and said to be anti-allergic, anti-oxidant, anti-pyretic³¹. It contains alkaloids, diterpenoid, glycosides, steroids, sesquiterpenoid and polysaccharides³².

Tinospora extract shows therapeutic potential for management of asthmatic inflammation and other lung inflammatory conditions against oxidative stress, pro-inflammatory mediator release and redox signaling in the murine model of asthma³³.

Jivanti: (*Leptadenia reticulata* Retz.)

Jivanti is a branched twining shrub, leaves thinly coriaceous, ovate and cordate. Flower greenish-yellow and seeds narrowly ovate-oblong. And it is an antibacterial, antimicrobial, respiratory stimulant and depressant³⁴.

Gas chromatography-mass spectrometry (GC-MS) analysis of the ethanolic extract of whole plant of *L. reticulata* revealed the presence of 32 phytochemicals³⁵.

Anti-asthmatic activity experiment was done on a Guinea pig, and rat. A result of the experiment was histamine (10 µg/ ml) produced dose-dependent contraction of guinea pig ileum. Pre-treatment with hydro



alcoholic extract of *L. reticulata* (0.8 mg/ml) significantly inhibited ($p < 0.01$) the contractile effect of histamine³⁶.

Hapusha: (*Juniperus communis* Linn.)

An evergreen dense diffuse shrub leaves sharply pointed, linear, flowers axillary, fruit globose berries, blue-black and seed usually 3 and ovoid. It is said to be Anti-microbial, anti-fungal, anti-malarial, and Anti-hypercholesterolemic activity³⁷.

Essential oil is largely comprised of monoterpene hydrocarbons such as β -pinene (5.0%), α -pinene (51.4%), sabinene (5.8%) and limonene (5.1%)³⁸.

Juniper oil is useful to inhale the steam for respiratory infections, colds, asthma, bronchitis, etc³⁹.

Gunja: (*Abrus precatorius* Linn.)

Gunja is a deciduous wiry climber, leaves abruptly pinnate with many pairs of leaflets, Seeds ovoid, scarlet with a black spot round the hilum and glossy⁴⁰. The volatile oil found in shell oil limonene (19.08%), ocimene (8.94%) and myrcene (8.60%) and zingiberene (6.02%). In seed oil the dominant monoterpenes are sabinene (10.93%) and camphene (6.45%), while were zingiberene (10.75%), farnesene (5.30%), sesquiphelladrene (4.47%) and curcumene (4.41%) were the prominent sesquiterpenes, and good ant-oxidantal property⁴¹.

The ethanol extract of *A. precatorius* leaves

significantly decreased milk induced leukocytosis and eosinophilia in mice in a dose dependent manner⁴².

Meshashrunji: (*Gymnema sylvestre* R.Br.)

A large woody climber leaves simple, opposite and root bark light brown cracking horizontally⁴³. Alkaloids, terpenoids, tannin, saponin, flavonoid, phenol and anthraquinones found in *G. Sylvestre*, and it shows antioxidant and antimicrobial activity⁴⁴.

Ethanol ext. of *G. sylvestre* leaves was evaluated for antiasthmatic activity using histamine and acetylcholine-induced bronchospasm, mast cell degranulation and histamine induced constriction on isolated guinea pig tracheal chain at different dose levels and concludes that the antiasthmatic activity of ethanolic ext. of *G. Sylvestre* leaves may be due to the presence of flavonoids or steroids⁴⁵.

Dronpushpi: (*Leucas aspera* Willd.) is an annual erect, stout, hairy, aromatic herb having quadrangular stem, leaves simple, opposite, ovate-lanceolate, flowers white, terminal or axillary whorls, and it shows Anti-microbial activity⁴⁶. The essential oil identified from the leaf is α -farnesene (26.4%), α -thujene (12.6%) and menthol (11.3%) were the major constituents and among the 10 compounds identified from the flower volatiles, amyl propionate (15.2%) and isoamyl propionate (14.4%)



were dominant⁴⁷. Methanolic extract of dried whole plant of *Leucas aspera* reported antiasthmatic activity *in-vivo* models like histamine induced bronchospasm in guinea pigs, passive paw anaphylaxis in rats and milk induced eosinophilia mice and *in vitro* model like mesentric mast cell degranulation by egg albumin etc⁴⁸.

Katphala: (*Myrica nagi* Linn.)

An evergreen dioecious tree, bark rough with deep vertical wrinkles, grey or brownish grey, leaves simple, lanceolate, acute or obtuse⁴⁹. The volatile compounds found to be Nerolidol, α -pinene, α -selinene, β -caryophyllene, β -selinen, α -caryophyllene, α -cadinol, linalool in the leaves and in the bark n-Hexadecanol; eudesmol acetate; palmitic acid; cis- β -caryophyllene; n-pentadecanol; n-octadecanol. Volatile oil reported to antimicrobial activity. The antiasthmatic potential of ethanol extract of the bark (75 mg/kg and 150 mg/kg, p.o.) was further supported by exhibiting antiallergic activity due to marked inhibition of eosinophil accumulation ($p < 0.05$) in allergic pleurisy test as well as significant inhibition in the rise in plasma exudation ($p < 0.05$) in acetic acid-induced vascular permeability⁵⁰.

DISCUSSION

Arka Kalpana from the *Arka prakasha* was screened for *Shwasagna karma*. Total 16 *arka kalpana* are mentioned for *Shwasa roga* mainly caused by *KaphaVatadosha*. *Arka* indicated for *shwasa* are *Kaphavatahara dravyas* with *Shwasaghna karma*. *Kaphahara* because of *Usna veerya*, *Katu Vipaka* and *Katu, Tikta, Kasaya Rasa*. *Vatahara* because of its *Usna Virya*. So the drugs having these properties help in the management of *Shwasa roga*. Among 16 drugs, 13 drugs are proven as antiasthmatic as per studies done on animal models and human. Studies upon *Dhanyaka*, *Hapusha* and *Prisnaparni* aren't proved as anti-asthmatic activity but in classical text mentioned as expectorant. A clinical study revealed that *Ardraka* and *Bharangi arka* Nebulization was effective in *vegavastha* of *tamaka shwasa*. Essential oil or Volatile oil is generally extracted by distillation process. The volatile oil when administered orally or inhalation increases the respiratory secretions probably by direct stimulation. They act like expectorant and liquefy by increasing the secretions, expel out and relax the irritated mucosa.

CONCLUSION

In the present review on *Shwasaghna dravyas* of *Arka prakasha*, 16 *Arka kalpana* are mentioned, the *dravyas* were indicated for *Shwasa*. Recent experimental and



clinical studies reveal the effect of these herbs on respiratory system and hence open an avenue for clinical research on these *Arka kalapana*.



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