

Pharmaceutico-therapeutic vistas of *Kasisa* (green vitriol) in Ayurveda

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Abstract Since ages the Indians have the knowledge of using *Kasisa* (hydrous ferrous sulphate/green vitriol) in different modalities. *Kasisa* is commonly placed under *Uparasa* group of drugs and is widely used in therapeutics of Ayurveda. *Brihatrayi* (Charaka Samhita, Sushruta Samhita and Ashtanga Hridaya) is the first known Ayurveda literature that introduced its medicinal utilities, and later on *Rasashastra* (the iatrochemistry of Ayurveda) treatises comprehensively described its complete mineralogical profile, sources, distribution, varieties, *Shodhana* (purification and detoxification), *Marana* (calcinations cycles), *Satvapata* (metal extraction), pharmacodynamic properties, actions, therapeutic indications, posology, adjuvants, and formulations in a systemic manner. Scattered information exploring therapeutic potential of *Kasisa* is accessible and there is need to assemble it. Therefore, an effort is made to assemble the scattered information in prehistoric texts, *Brihatrayi*, *Nighantu*, *Rasashastra* and other Ayurvedic treatises along with modern evidences highlighting the role of *Kasisa* in therapeutics. Citations relevant to topic were screened.

Keywords *Kasisa*; *Kasisa Bhasma*; *green vitriol*; *Shodhana*; *Marana*; *Brihatrayi*; *Ayurveda*; *Rasashastra*

Abbreviations: Rm.= Rasamrita, R.S.= Rasayana Sara, A.A.G.S.= Ayurvediya Ausadhi Gunadharm Shastra, R.T.S.= Rasatantra Sara, R.Y.S.= Rasa Yoga Sagar, R.P.S.= Rasa Prakash Sudhakar, A.V.R.= Anubhava Vaidhya Rasasyamu, V.P.P.= Vishishta Prokta Pulippani, A.K.= Anandkanda, R.R.S.= Rasa Ratna Samucchya, A.P.= Ayurved Prakash, R.M.= Rasa Manjari, R.T.= Rasa Tarangini, R.J.N.= Rasa Jala Nidhi, R.S.S.= Rasendra Sara Sangrah, S.Y.S.= Siddha Yoga Sangraha, Raso.T.= Rasoddhar Tantra, V.V.= Vruddha Vaidhadhara, A.A.K.= Ayurvediya Ausadhi Karana, V.Y.R.= Vaidya Yoga Ratnavali, B.R.R.S.= Brihad Rasa Raja Sundara, R.K.D.= Rasa Kamdhenu, R.C.= Rasendra Chudamani, R.N.= Raja Nighantu, R.D.= Rasa Deepika, B.P.= Bhava Prakash, B.R.P.= Bhartiya Rasa Paddhati, A.F.I.= Ayurvedic Formulary of India, D.G.V.= Dravyaguna Vigyana, I.M.M.= Indian Materia Medica, Ch. Su.= Charaka Sutrasthana, Ch. Chi.= Charaka Chikitsasthana, Su. Chi.= Sushruta Chikitsasthana, Su. Ut.= Sushruta Uttartantra, A. H. Chi.= Ashtanga Hridaya Chikitsasthana, A. H. Ut.= Ashtanga Hridaya Uttartantra

Introduction

Rasashastra, the iatrochemistry of Ayurveda, is a well recognised science serving humanity with its unique heritage of drugs derived from metals, minerals, and animal origin combined with certain herbs. These drugs undergo various purification or detoxification methods, incineration process, and used in treating wide range of ailments. *Kasisa* (hydrous ferrous sulphate) is a renowned mineral drug in *Rasashastra* treatises. It is also used as material for writing purpose since centuries [1]. Since centuries, it has been traditionally used among Ayurveda practitioners to treat wide range of ailments, viz. anemia, dysmenorrhoea, dysentery, diarrhoea, haemorrhage, ulcers and vitiligo conditions [2]. In present times this drug has been subjected to several pharmaceutical, pharmacological and pre-clinical investigations, though clinical reports are limited or non-published. So far, no attempt has been made to review or compile the medico-historical aspects of *Kasisa* with its therapeutic potentials in light of modern scientific information supporting the same. Considering this, an effort has been made to assemble the pharmaceutico-therapeutic information of *Kasisa* from ancient Ayurveda literature, with a special screening through the texts of *Rasashastra*.

Historical background

Samhita Kala

No reference of *Kasisa* is available in *Veda*. The use of *Kasisa* as medicine is there since *Samhita Kala*. In *Brihatrayi* (Charaka Samhita, Sushruta Samhita and Ashtanga Hridaya), two types (*Kasisa* and *Pushpa Kasisa*) and the reference about the external and internal application of *Kasisa* are available. Later the detailed description of *Kasisa* and its therapeutic use in the treatment of many disorders is found in almost all *Rasashastra* texts.

Rasashastra and Adhunika Kala

Rasashastra got development in between 8th to 17th century, and several treatises belong to this period (viz. A.P., R.P.S., R.S.S. etc.) that narrated *Guna* (properties), *Karma* (actions), *Shodhana* (purification and detoxification), *Marana* (incineration/calcinations cycles to prepare *Bhasma*), *Satvapatana* (metal extraction), varieties, formulations of *Kasisa* in a systemic manner. In R.M., *Kasisa* is mentioned as *Rasavadgunakaraka* i.e. it possesses the properties like *Parada* (Mercury) [3]. Several texts during or after 20th century, viz. R.T., D.G.V., I.M.M. etc. has given comprehensive description on *Kasisa*.

Mineralogical description

Kasisa is considered as Ferrous sulphate (chemical formula: $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$), also known by other names: Iron sulphate, Green Vitriol, and Iron Vitriol. It is available as odourless, pale, bluish green crystals or granules, and possess following characteristics: Molecular weight – 278.02, pH – 3.7, Crystal system – monoclinic, Cleavage – perfect, Fracture – conchoidal/brittle, Lusture – vitreous, Streak – Uncoloured/ sub-transparent to translucent, Hardness – 2, Specific gravity – 1.8 to 1.9, and Solubility – free soluble in water and insoluble in alcohol [4,5,6].

Origin and occurrence

Kasisa is obtained in natural form and is also prepared artificially, since ancient times. Most probably *Kasisa* is obtained from where iron is obtained, and some places from where *Shilajit*, *Sphatika*, *Suvarna Makshika* are found. Natural *Kasisa* is obtained where there are hot springs of sulphur and is

formed by decomposition of iron sulphide. It is available in India (abundantly in Bihar, Punjab and Uttar Pradesh), United states, Spain, Germany, and Sweden. Artificial *Kasisa* is prepared by reacting sulphuric acid on big iron pieces [4,5,6].

Vernacular names and Sanskrit synonyms

Sanskrit: *Kasisa*, English: Green vitriol, ferrous sulphate, Latin: Ferri sulphas, Hindi & Sindhi: Kasis, Marathi/ Konkani: Hira Kasa, Gujarati: Hira Kasi, Bengali: Hire Kasa, Punjabi/ Kashmiri: Sangai Sabja, Tamil/ Kannad/ Malayalam: Annabhedhi, Parsi: Tritiyasaba, Baluchi: Ladha [4,5,6].

Different Sanskrit synonyms of *Kasisa* are described which are related with its origin/availability, morphological characters, properties, actions, therapeutic efficacy, etc. These are detailed in Table 1 [3,7-14].

Table 1: Synonyms of *Kasisa* according to different texts

Synonyms	A.P.	A.K.	R.M.	R.T.	R.S.S.	R.J.N.	R.K.D.	R.D.	B.P.
<i>Amlamrittika</i>	+	-	-	-	-	-	-	-	-
<i>Ayogandhaka</i>	-	-	-	-	-	-	-	+	-
<i>Ayogandhamla sambhuta</i>	-	-	+	-	-	+	-	-	-
<i>Chakshusha</i>	-	-	-	-	-	-	+	-	-
<i>Dhatu Kasisa</i>	+	+	-	-	+	+	-	-	+
<i>Dhatu sekaram</i>	-	-	-	-	-	-	+	-	-
<i>Dantaranjana</i>	-	-	-	-	+	-	-	-	-
<i>Hamsalomasa</i>	-	+	-	-	-	-	-	-	-
<i>Kesara</i>	-	+	-	-	-	-	-	-	-
<i>Kechara</i>	-	-	+	-	+	-	+	-	-
<i>Kamsaka</i>	-	-	-	-	-	-	+	+	-
<i>Khaga</i>	-	-	+	+	-	-	+	+	-
<i>Kasisa</i>	-	-	+	+	+	+	-	+	+
<i>Kauseesa</i>	-	-	-	-	-	-	+	-	-
<i>Maliyasa</i>	-	-	-	-	-	-	+	-	-
<i>Pushpa Kasisa</i>	+	-	-	+	-	-	-	-	-
<i>Pamshu Kasisa</i>	+	+	-	+	-	-	-	-	+
<i>Shodhana</i>	-	+	-	-	-	-	-	-	-
<i>Shubhra</i>	-	+	-	-	-	-	-	-	-

Categorization in different Varga

Acharya have adopted different methodology according to their intellectual sense, and classified *Kasisa* under different groups or *Varga*, shown in Table 2. It is found commonly placed under *Uparasa* group of drugs.

Types and of *Kasisa*

In *Rasashastra*, drugs are classified according to their colour, size, shape and origin. Available literature reveals various types of *Kasisa*, based on colour and its origin (Table 3) [7-9,12,15-19]. Commonly there are two types: *Valuka Kasisa* and *Pushpa Kasisa*. *Valuka Kasisa* is like sand, with greenish and slight yellowish color, while the *Pushpa Kasisa* is in small crystalline form with bright green color [20].

Table 2: Classification of Kasisa in different Varga

Varga	Reference
Uparasa	Rasarnava, Rasa Chintamani, Rasa Ratna Samuchchaya, Rasopanishada, Rasendra Sara Sangraha, Rasa Chudamani, Rasa Hridaya Tantra, Ayurved Prakash
Upadhata	Sharangadhara Samhita, Rasa Tarangini, Rasa Dhatu Prakasha
Dhatu Varga (Lauha Varga)	Rasamrita

Table 3: Types of Kasisa according to different texts

Types	R.R.S.	R.T.	R.N.	R.C.	R.K.D.	A.P.	A.K.	B.R.R.S.	R.P.S.
According to origin									
Valuka Kasisa	+	-	-	-	-	-	-	+	+
Pushpa Kasisa	+	+	-	-	-	+	+	+	+
Churna Kasisa	-	+	-	-	-	-	-	-	-
Pamsu Kasisa	-	-	-	-	-	+	-	-	-
Heera Kasisa	-	-	-	-	-	-	+	-	-
According to colour									
Harita Kasisa	-	-	-	-	+	-	+	-	-
Shukla Kasisa	-	-	+	+	+	-	+	+	-
Peeta Kasisa	-	-	+	+	+	-	+	+	-
Rakta Kasisa	-	-	-	-	-	-	+	+	-
Krishna Kasisa	-	-	+	+	-	-	+	-	-

Selection of therapeutically suitable type (*Grahya-Agrahyata*)

Many of the *Rasashastra* drugs are having toxicity, so awareness of the drug is must. In *Brihatrayi*, clear description of *Grahya-agrahyata* of *Kasisa* is not described. After screening all *Rasa Granthas*, it can be said that yellowish *Kasisa* having bluish tinge and is lustrous, which is called *Pushpa Kasisa*, is used for the medicinal purpose in human being [4,5,6].

Shodhana of Kasisa

Since raw *Kasisa* could be toxic or not suitable for therapeutics, hence various methods of *Shodhana* of *Kasisa* are mentioned in classics, such as (i) *Bhavana* (levigation), (ii) *Swedana* (boiling/steaming), (iii) *Nimajjana* (immersion), or (iv) *Klinna* (making wet) methods. These methods are detailed in Table 4 [9,11,12,15,18,19,21,22]. Researches have found that the *Shodhana* method of *Kasisa* mentioned in R.R.S. (5/54) is suitable for only artificial prepared *Kasisa* [20]. The commonly practiced *Shodhana* methods for both artificial and natural *Kasisa* are mentioned in R.T. (21/230) and A.P. (2/275).

Table 4: Shodhana methods of Kasisa in ancient texts

Shodhana Dravya	Procedure	Yantra	Reference
Nimbu Swarasa	Bhavana	Khalva	R.S.; B.R.R.S.; R.J.N.
Jambiri Swarasa	Bhavana	Khalva	B.R.R.S.
Pancha Pitta (Varaha, Chaga, Mahisa, Mayura, Matsya)	Nimajjana	Khalva	R.R.S.
	or Bhavana		
Stri Shonita	Klinna	Khalva	R.R.S.; R.P.S.; B.R.R.S.; R.J.N.
Kasamarda Swarasa	Bhavana	Khalva	R.K.D.

<i>Rajakoshataki</i>	<i>Bhavana</i>	<i>Khalva</i>	R.K.D.
<i>Bhringaraja Swarasa</i>	<i>Klinna</i>	<i>Khalva</i>	R.R.S.; R.J.N.
	<i>Bhavana</i>	<i>Khalva</i>	Rm.
	<i>Swedana</i>	<i>Dola Yantra</i>	R.T.

Energetics

Pharmacodynamic properties (viz. *Rasa*, *Guna*, *Virya*, action on *Dosha*) of *Shuddha Kasisa* are based on biophysical, experiential, inferential and intuitional mechanisms. Based upon these properties, classical texts have claimed the wide range of therapeutic attributes of *Kasisa*. With the scrutiny of various verses in different texts, slight difference in views regarding pharmacodynamics properties of *Kasisa* are noted down as in Table 5 [3,7,8,9,10,15,17,18,22].

Table 5: Pharmacodynamic properties and Dosha effects of *Shuddha Kasisa*

Reference	<i>Rasa</i> (taste)	<i>Guna</i> (quality)	<i>Virya</i> (potency)	Dosha effect
A.K.	<i>Kashaya</i> , <i>Tikta</i>	<i>Amla</i> -	-	<i>Vata Kaphahara</i>
R.C.	<i>Amla</i> , <i>Kashaya</i>	<i>Guru</i>	<i>Ushna</i>	<i>Vata Kaphahara</i>
R.R.S.	<i>Amla</i> , <i>Kashaya</i>	<i>Guru</i>	<i>Ushna</i>	<i>Vata Kaphahara</i>
R.S.S.	-	<i>Snigdha</i>	-	-
R.M.	-	<i>Sheeta</i> , <i>Snigdha</i>	-	-
A.P.	<i>Amla</i> , <i>Madhura</i>	-	<i>Ushna</i>	-
R.T.	<i>Kashaya</i>	<i>Grahi</i>	<i>Ushna</i>	<i>Vata Kaphahara</i>
B.R.R.S.	<i>Amla</i> , <i>Kashaya</i>	<i>Grahi</i>	<i>Ushna</i>	-
Rm.	<i>Kashaya</i> , <i>Amla</i>	-	<i>Ushna</i>	-

Karma (action) and Rogaghnata (therapeutic indications)

Karma denotes action of a drug based on its properties. Various texts have highlighted a number of actions and therapeutic indications of *Shuddha Kasisa*, which are detailed in Table 6 [7,9-12,15,22]. Several modes of therapeutic usage is available in literature, stipulated in Table 7 [9].

Table 6: Various *Karma* and *Rogaghnata* of *Shuddha Kasisa*

<i>Karma/Rogaghnata</i>	R.R.S.	Rm.	R.T.	A.P.	R.K.D.	R.J.N.	R.S.S.
<i>Rakta Sanjanan</i> (hematinic)	-	-	+	-	-	-	-
<i>Raja Pravartaka</i> (promotes menstruation)	-	-	+	-	-	-	-
<i>Kesharanjana</i> (dyes hair)	+	-	-	+	-	+	-
<i>Ama Sanshoshana</i> (removes non-metabolized products)	+	-	-	-	-	-	-
<i>Balya</i> (promote strength)	-	+	+	-	-	-	-
<i>Sankochaka</i> (astringent)	-	+	+	-	-	-	-
<i>Shvitraghna</i> (anti-vitiligo)	+	+	+	+	+	+	+
<i>Netrya</i> (good for eyes)	+	+	+	+	+	+	+
<i>Vishaghna</i> (detoxifying)	+	+	+	+	-	+	-
<i>Vatamayahara</i> (pacify <i>Vata</i> disorders)	+	-	+	+	-	+	-
<i>Kacha Ranjana</i> (stains <i>Kacha</i>)	+	-	+	-	-	+	-
<i>Shleshmamayahara</i> (pacify <i>Kapha</i> disorders)	+	-	+	+	-	+	-
<i>Mutrakrichchrahara</i> (relieves dysuria)	-	-	+	+	+	-	-
<i>Kandughna</i> (relieves itching)	-	-	+	+	-	-	-
<i>Pandughna</i> (anti-anemic)	+	-	+	-	-	-	-

<i>Krimighna</i> (deworming agent /antibacterial)	-	-	+	-	-	-	-
<i>Kshayaghna</i> (cures emaciation)	+	-	-	-	-	-	-
<i>Plihaghna</i> (cures splenomegaly)	-	+	+	-	-	-	-
<i>Kusthaghna</i> (cures skin disorders)	-	-	-	-	+	-	-
<i>Jwaraghna</i> (antipyretic)	-	-	+	-	-	-	-
<i>Ashmarighna</i> (removes calculi)	-	-	-	+	-	-	-
<i>Visarpa Shothahara</i> (anti-inflammatory in erysipelas)	-	-	+	-	-	-	-
<i>Savarnakara</i> (promotes complexion)	-	-	+	-	-	-	-
<i>Danta Krimihara</i> (cures tooth infection)	-	-	+	-	-	-	-
<i>Hikkahara</i> (anti-hiccough)	-	-	+	-	-	-	-
<i>Vranaghna</i> (wound healer)	-	-	-	+	-	-	-
<i>Rasabandhana</i> (binds mercury)	-	-	-	-	+	-	-
<i>Tridosahara</i> (pacify <i>Vata</i> , <i>Pitta</i> , and <i>Kapha</i>)	-	-	-	-	+	-	-
<i>Apasmritighna</i> (nootropic)	-	-	-	-	+	-	-
<i>Pittaprashmanahara</i> (cures <i>Pitta</i> disorders)	-	-	-	-	-	+	+
<i>Rasayana Gunakaraka</i> (rejuvenates)	-	-	-	-	-	-	+

Table 7: Therapeutic usages of *Shuddha Kasisa*

Drug	Disease	Anupana
<i>Shuddha Kasisa</i>	<i>Pleehavridhi</i>	Water or Ghee
<i>Shuddha Kasisa</i>	<i>Kashtartava</i>	<i>Kumari Swarasa</i>
<i>Shuddha Kasisa + Twaka</i>	<i>Raktaipata</i>	-
<i>Shuddha Kasisa + Tankana + Kumari Sara</i>	<i>Rajorodhodbhavaruja</i>	-
<i>Shuddha Kasisa (1 Ratti) + Kapittha Phalamajja (4 Ratti)</i>	<i>Hikka</i>	-
<i>Kasisa Drava (as Basti)</i>	<i>Arsha</i>	-
<i>Shuddha Kasisa + Dhatura Beeja + Gunja Beeja</i>	<i>Shwitra</i>	-
<i>Kasisa Jala</i>	<i>Visarpa Shotha</i>	-
<i>Shuddha Kasisa + Sphatika + Hingu + Devdaru</i>	<i>Krimidanta</i>	-
<i>Shuddha Kasisa + Bakuchi + Shuddha Gairika</i>	<i>Shwitra</i>	-

Marana of *Kasisa*

In *Rasashastra* literature, 17 methods of *Marana* or *Bhasmikarana* of *Kasisa* are described. According to Rm. and R.T. texts, *Putra* (particular pattern of heat) should be given till *Kasisa Bhasma* become tasteless i.e. *Niramlatva*. Several liquid medias such as *Kanji*, *Swarasa/Kwatha* of *Snuhipatra*, *Kumari*, *Nimbu* etc. and metal/minerals viz. *Parada* (mercury) or *Gandhaka* (sulphur) are mentioned as *Bhavana dravya*. Details are given in Table 8 [9,15,21-29]. Structurally the prepared *Bhasma* is organo-metallic in nature. The repeated calcinations of *Kasisa* impart the quality in resulting *Bhasma* and facilitate particles to undergo submicron size. Several published reports are also available on the standardization, fingerprinting, physicochemical and quality profile of *Kasisa Bhasma* using sophisticated analytical techniques [1,2,20,30].

Indications of *Kasisa Bhasma*

Kasisa Bhasma is indicated in wide range of diseases as per different textbooks of *Rasashastra*. Various therapeutic roles according to different literature are shown in Table 9 [3,7,8-12,15,19].

Table 8: Marana methods of Kasisa in ancient texts

Referen ce	Bhavana Dravya	Yantra	Marana Process	Putra	No. of Putra	Remarks
R.T.	<i>Kanji + Nimbu Swarasa</i>	<i>Khalva, Samputa</i>	<i>Putra Pachana</i>	<i>Laghu</i>	-	<i>Niramlatva</i>
	<i>Snuhipatra Swarasa</i>	<i>Khalva, Samputa</i>	<i>Putra Pachana</i>	<i>Laghu</i>	-	<i>Niramlatva</i>
Rm.	<i>Nimbu Swarasa</i>	<i>Khalva, Samputa</i>	<i>Putra Pachana</i>	10 <i>Prastha Upala</i>	-	<i>Niramlatva</i>
R.S.	<i>Parad, Gandhaka, Kasisa</i>	<i>Kupi, Valuka Yantra</i>	<i>Putra Pachana</i>	-	-	-
A.A.G.S.	<i>Kshara, Amla</i>	<i>Khalva, Samputa</i>	<i>Putra Pachana</i>	-	-	-
R.T.S.	<i>Bhringaraja Bharjan</i>	<i>Swarasa, Khalva, Samputa</i>	<i>Putra Pachana</i>	<i>Laghu</i>	03	-
R.Y.S.	<i>Kumari, Swarnakshiri, Dadhi</i>	<i>Kantakari, Khalva, Samputa</i>	<i>Putra Pachana</i>	<i>Gaja Putra</i>	-	-
A.V.R.	<i>Rice washed water, Jambiri Swarasa</i>	<i>Jambiri Khalva, Samputa</i>	<i>Putra Pachana</i>	10 <i>Upala</i>	-	-
V.P.P.	<i>Jambiri Rasa, Bimbipatra Rasa,</i>	<i>Khalva, Samputa</i>	<i>Putra Pachana</i>	20 <i>Upala</i>	-	-
S.Y.S.	<i>Amalaki, Bhringaraja, Langali, Dadima</i>	<i>Khalva, Samputa</i>	<i>Putra Pachana</i>	<i>Ardha Gajaputa</i>	02	-
Raso.T.	<i>Triphala, Bhringaraja, Kumari</i>	<i>Khalva, Samputa</i>	<i>Putra Pachana</i>	<i>Varah Putra</i>	-	-
V.V.	<i>Kumari</i>	<i>Khalva, Samputa</i>	<i>Putra Pachana</i>	<i>Agni Putra</i>	-	-
	<i>Kanji</i>	<i>Khalva, Samputa</i>	<i>Putra Pachana</i>	<i>Agni Putra</i>	-	-
A.A.K.	4 part <i>Kasisa + ¼</i> <i>Gandhaka, Kumari Bhavana</i>	<i>Khalva, Samputa</i>	<i>Putra Pachana</i>	<i>Gaja Putra</i>	-	-
R.R.S.	<i>Gandhaka</i>	<i>Khalva, Samputa</i>	<i>Putra Pachana</i>	-	-	-
V.Y.R.	<i>Jambiri Nimbu Swarasa</i>	<i>Khalva, Samputa</i>	<i>Putra Pachana</i>	-	-	-

Kasisa in Brihatrayi

Brihatrayi, the prime texts of Ayurveda, contribute number of references pertaining to clinical application of *Kasisa*. *Kasisa* is mentioned to be used for external therapeutic purposes under various formulations. These citations in *Brihatrayi* are listed in Table 10 [31-33]. In Charaka Samhita, 14 preparations of *Kasisa* are described. *Kasisa* was used externally in the form of *Lepa*, *Varti* and *Taila*. In Sushruta Samhita, approximately 15 preparations of *Kasisa* have been described. Ashtanga Hridaya, *Kasisa* was used externally and internally in the form of *Churna*, *Lepa*, *Pichu* and *Taila*. There were total 15 preparations of *Kasisa* available.

Table 9: Therapeutic indications of Kasisa Bhasma

Diseases	R.P.S.	A.K.	R.R.S.	R.K.D.	A.P.	R.M.	R.T.	R.J.N.	R.S.S.
Visha (toxicity)	+	+	+	-	+	+	+	-	-
Shwitra (vitiligo)	+	-	-	+	-	+	+	+	-
Vrana (wounds)	+	+	+	+	-	-	-	-	-
Kshaya (emaciation)	+	-	+	-	-	-	-	+	+
Pandu (anemia)	+	-	+	-	-	+	+	-	+
Kamala (Jaundice)	-	-	-	-	-	-	-	-	+
Pleeha (spleen disorders)	+	-	-	-	-	-	+	-	-
Gulma (abdominal lump)	+	-	+	-	-	-	-	+	-
Yakshma (tuberculosis)	+	-	-	-	-	-	-	-	-
Mutrakrichra (dysuria)	+	+	-	-	+	-	-	-	-
Ashmari (calculi)	-	+	-	-	-	-	-	-	+
Kushtha (skin disease)	-	+	-	+	-	-	-	-	-
Netraroga (eye disorders)	+	-	-	+	-	-	-	-	-
Shoola (pain)	-	-	+	-	-	-	-	+	+
Arshas (piles)	-	-	+	-	-	-	-	-	-
Atisara (diarrhoea)	-	-	-	-	-	-	-	-	+
Pravahika (dysentery)	-	-	-	-	-	-	-	-	+
Krimi (worm infestation)	-	-	-	-	-	-	+	-	+
Jeerna Jwara (chronic fever)	-	-	-	-	-	-	+	+	-

Table 10: Important therapeutic preparations of Kasisa in Brihatrayi

Reference	Disease	Preparation
Charaka Samhita		
Ch. Su. 3/5	Kustha	Lepa
Ch. Su. 3/10	Kustha	Lepa
Ch. Chi. 7/102	Kustha	Lepa
Ch. Chi. 7/109	Kustha	Lepa
Ch. Chi. 7/114	Kustha	Lepa
Ch. Chi. 7/117	Kustha	Lepa
Ch. Chi. 7/167	Kustha	Lepa
Ch. Chi. 21/126	Visarpa	Lepa
Ch. Chi. 25/115	Vrana	Lepa
Ch. Chi. 25/117	Vrana	Lepa
Ch. Chi. 26/154	Netra Roga	Drishti Pradavarti
Ch. Chi. 26/271	Khalitya	Mahanila Taila
Ch. Chi. 30/121	Yonivyapada	Yoni Varti
Ch. Chi. 30/79	Yonivyapada	Yoni Varti
Sushruta Samhita		
Su. Chi. 1/60	Vrana	Rasa Kriya
Su. Chi. 1/96	Pandukarma	Pralepa
Su. Chi. 1/97	Pandukarma	Pralepa
Su. Chi. 1/103	Romasanjanana	Lepa
Su. Chi. 18/54	Galaganda	Avachurnana
Su. Chi. 19/40	Upadansha	Avachurnana
Su. Chi. 20/21, 22	Kesharanjana	Pratisarana
Su. Chi. 25/32	Kesharanjana	Saireyakadi Taila
Su. Ut. 11/16	Praklinna Vartma	Anjana

Su. Ut. 12/15	<i>Sirotpata</i>	<i>Anjana</i>
Su. Ut. 12/18	<i>Siraharsha</i>	<i>Anjana</i>
Su. Ut. 12/23	<i>Arjuna</i>	<i>Anjana</i>
Su. Ut. 12/46	<i>Puyalasa</i>	<i>Anjana</i>
Su. Ut. 17/43	<i>Kaphaja Timira</i>	<i>Anjana</i>
Su. Ut. 17/44	<i>Kaphaja Timira</i>	<i>Anjana</i>
Ashtanga Hridaya		
A. H. Chi. 16/56	<i>Kumbha Kamala</i>	<i>Churna + Milk</i>
A. H. Chi. 18/26	<i>Visarpa</i>	<i>Lepa</i>
A. H. Chi. 19/67	<i>Twak Roga</i>	<i>Avachurnana</i>
A. H. Chi. 19/71	<i>Kustha</i>	<i>Avachurnana</i>
A. H. Chi. 19/73	<i>Kilasa</i>	<i>Lepa</i>
A. H. Ut. 11/5	<i>Puyalasa</i>	<i>Anjana</i>
A. H. Ut. 11/6	<i>Krimigranthi</i>	<i>Pratisarana</i>
A. H. Ut. 16/40	<i>Netra Kandru</i>	<i>Anjana</i>
A. H. Ut. 16/55	<i>Pakshamashata</i>	<i>Anjana</i>
A. H. Ut. 22/51	<i>Apakva Talupaka</i>	<i>Avachurnana</i>
A. H. Ut. 24/28	<i>Indralupta</i>	<i>Lepa</i>
A. H. Ut. 25/40	<i>Vranavasadana</i>	<i>Lepa</i>
A. H. Ut. 34/15	<i>Upadansha</i>	<i>Lepa</i>
A. H. Ut. 34/51	<i>Yonivyapada</i>	<i>Taila Pichu</i>
A. H. Ut. 34/55	<i>Yonivyapada</i>	<i>Churna</i>

Doses, Adjuvants and important Formulations of *Kasisa Bhasma*

Doses of *Kasisa Bhasma* mentioned in different texts are as follows:

A.F.I. : 250 mg; [34]

Rm. : 1-2 *Ratti*; [22]

D.G.V. : 1-2 *Ratti*; [35]

R.T. : ½ - 2 *Ratti*; [9]

B.R.P. : ½ - 2 *Ratti*; [36]

Text book of *Rasashastra* (by Damodar Joshi) : ½ to 2 *Gunja* [5]

Specific adjuvants are mentioned in classical texts for different *Doshaja* disorders, such as:

Vata vikara : *Triphala Churna*

Pitta vikara : *Sharkara*

Kapha vikara : *Madhu*

Important Ayurvedic formulations containing *Kasisa* are: *Kasisadi Tailam*, *Kasisadi Ghritam*, *Kasisa Bhasma*, *Rajah Pravartani Vati*, *Kasisa Drava* etc.

Contemporary reports on therapeutic potential

Only a few clinical or experimental reports are available in this regard. Based on claims of *Krimighna* property of *Kasisa Bhasma* and external use of *Shuddha Kasisa* in wound healing, a comparative antimicrobial study was conducted, which revealed significant antibiotic, antibacterial and antifungal

effects, where *Shuddha Kasisa* shown slight better activity [37]. The *Panduhara* property was validated by two clinical reports that determined the significant role of *Kasisa Bhasma* in the management of sickle cell anaemia and iron deficiency anaemia [38,23]. Recent experiments on rat models also substantiated the anti-anemic activity of *Kasisa Bhasma* [2].

Toxicity and Safety concerns

Although, extensive works have been conducted on *Kasisa Bhasma*, no conspicuous information on toxicity is available so far. A repeated dose oral toxicity study on *Kasisa Bhasma* for 28 consecutive days in Wistar rats found it completely safe in dosage mentioned [39]. A recent oral toxicity study on Charles foster albino rats also ascertained the safety and concluded that the *Kasisa Bhasma* is non-toxic and safer as compared to *Shodhita Kasisa* [40]. Another study of *Kasisa Bhasma* on rat models confirmed the non-toxicity and hepatoprotective activity against Carbon tetrachloride (CCl₄)-induced hepatotoxicity.^[2] Ayurvedic processes such as *Shodhana* and *Marana* of *Kasisa* helps to remove the impurities and toxic contents and to improve its efficacy.

Conclusion

Present review spotlights the pharmaceutico-therapeutic significance of *Kasisa* from Ayurvedic perspective; though these potentials are validated by only few evidence based studies. Existing literature underscores that *Shuddha Kasisa* and *Kasisa Bhasma* imbibes a tremendous quantifiable potential and deserves a special attention of scientific fraternity to explore its practical clinical applications. In contemporary researches, though standardisation and safety reports on *Kasisa* are available, the clinical and pharmacological studies are still limited. Present report will provide guiding information for future researchers to investigate un-explored potentials of *Kasisa*.

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