



International Journal of Pharmacy and Analytical Research (IJPAR)

IJPAR | Vol.13 | Issue 3 | Jul - Sept -2024

www.ijpar.com

ISSN: 2320-2831

DOI : <https://doi.org/10.61096/ijpar.v13.iss3.2024.297-308>


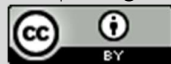
Review

Therapeutic Potential of *Heeraka Bhasma* (Incinerated Diamond ash): A review through Classical and Contemporary literature.

Rakshitha Shetty*, G. Priyadarshini , R. Koirala, K.S. Sakhitha, S. Kumar

Department of Rasashastra and Bhaishjya Kalpana, NIA, Jaipur - 302002, India.

Address for Correspondence- Dr. Rakshitha Shetty
Email: drrakshithashetty481@gmail.com

	Abstract
Published on: 15 Jul 2024	<p>The ancient Indian alchemical tradition of Rasashastra encompasses a diverse literature on the therapeutic application of metals, minerals, and gemstones. This tradition later integrated into Ayurveda, the indigenous medical system of India, forming a significant branch thereof. Within Rasashastra's classical texts, <i>Heeraka</i> (Diamond) is categorized under <i>Ratna Varga</i> (Precious gemstones classification), alongside other precious and semiprecious gemstones. Notably, <i>Heeraka Bhasma</i>, the incinerated ash of diamond, finds mention for treating internal abscesses, tumors, angina pectoris, and tuberculosis. Reviewing over 30 classical texts reveals various pharmaceutical procedures like <i>Shodhana</i>(Purification) and <i>Marana</i>(Process of preparing Bhasma), enhancing <i>Heeraka's</i> therapeutic potential. Common purification methods include <i>Nirvapa</i>(Hearing and Quenching) and <i>Swedana</i>(Boiling), while <i>Gajaputa</i>(Amount of Heat) is the commonest puta given for <i>Bhasma</i>(Incinerated Ash) preparation, often employing Karpasa Mula and 3-year-old <i>Nagvalli swarasa</i> as media. This review aims to comprehensively explore diamond's processing techniques and therapeutic attributes as described in classical literature and contemporary research.</p>
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Keywords: <i>Heeraka</i> , Diamond, Ayurveda, Review.	

INTRODUCTION

Diamonds are transparent crystals of tetrahedrally bonded carbon atoms formed under temperature of more than 1700 Fahr degree in the mantle of earth over 1-3 billion years ago at depths of more than 120 km under extreme pressure¹. India commercially produced diamonds prior to the 11th century and the majority of diamonds were excavated in the areas of present India, Pakistan and Afghanistan. Indian diamond mines were the only known working diamond mines in the world². Though earliest references of Diamond are found in texts like Kautilya's Arthashastra and Varamihira's Brihat Samhita, knowledge pertaining to the use of diamond as well as other gemstones for internal administration for therapeutic benefit in the form of *Bhasma*(incinerated ash) is found only in text books of *Rasashastra*(Ayurvedic pharmaceuticals). *Rasashastra*, the alchemical tradition that

existed in ancient India has a rich literature pertaining to the use of metals and minerals including gemstones for therapeutic purposes. Later it merged with the mainstream Ayurveda, the Indian system of medicine and remains as an important branch of Ayurveda. In classical texts *Heeraka* (Diamond) is classified under *Ratna Varga* (gems classification)³, a category that includes precious and semiprecious gemstones. At present Diamond, the hardest substance occurring in natural form is being considered for use in several medical applications.⁴ The use of diamond nanoparticles in modern medicine can be traced back to their use in traditional ancient Indian Ayurvedic medicine for healing cancer by boosting the immune system.⁵ In the classical texts of *Rasashastra*, *Heeraka Bhasma* (also called *Vajra Bhasma*, *Hira Bhasma* and *Diamond Bhasma* the incinerated ash of diamond is mainly indicated for the treatment of (*Vidradhi*) internal abscesses, (*Arbuda*) tumors, (*Arbuda*) cancer, (*Hridroga*) angina pectoris and (*Rajyakshma*) tuberculosis.⁶ An attempt was made to carry out a comprehensive review of diamond, its processing techniques and therapeutic aspects mentioned in the classical literature as well as the research works conducted in the contemporary period.

Presently *Heeraka Bhasma* is being manufactured by well known pharmacies in India like Patanjali, Dhootpapeshwar, Baidyanath, Unjha, etc. Price of 100 mg *Heeraka Bhasma* ranges from 700 to 1200 rupees. This review will possibly serve as a foundation for new research, guiding its design and providing a comprehensive understanding of the current knowledge landscape in context to *Heeraka*.

According to most of the *Rasashastra* classics *Heeraka* has been broadly classified under two categories, on the basis of *Jati* viz. *Brahmana*, *Kshatriya*, *Vaishya* and *Shudra*. The other classification is on the basis of Gender viz *Purush* (Male), *Stree* (Female) and *Napunsak* (Impotent).. *Purush Vajra* is the superior most, whereas *Napunsak Vajra* is inferior while *Stree Vajra* lies in the middle.⁷ *Heeraka* is also classified on the basis of colour- *Shweta* (white), *Rakta* (Red), *Pita* (Yellow), *Krishna* (Black). The Test of *Ratna* was specified by *Brihat Rasaraj Sundar* (B.R.R.S.) and *Rasa Tarangini* (R.T.) wherein the right *Heeraka* does not wear off on friction against stone, *lohadi* metals or any other material, in fact *Heeraka* should break other materials.

A literary review was conducted from classical texts of Ayurveda and *Rasashastra* in particular pertaining to *Heeraka*. Data were searched and analysed from texts like *Charak Samhita* (Ch.Sa), *Suhrut samhita* (Su.Sa), *Ashtang Sangraha* (As.Sa), *Chakradutta* (Ch.D), *Sharandhara Samhita* (Sh.Sa), *Bhava Prakasha* (B.P.), *Nighantus* like *Madanpala Nighantu* (M.N.) and *Raj nighantu* (R.N.) and *Rasashastra* literature including *Rasarnava* (R.Arnav), *Rasendra mangalam* (R.Ma), *Rasa Hridaya Tantra* (R.H.T.), *Rasendra Chudamani* (R.Chu), *Rasa Prakash Sudhakar* (R.P.S.), *Rasa Ratna Samuchaya* (R.R.S.), *Rasa Ratnakara* (R.R.), *Anandkand* (A.K.), *Rasa Paddhati* (R.P.), *Rasa Chintamani* (R.Chi), *Rasendra Chintamani* (Ra.Chi), *Rasamanjari* (R.Mn), *Rasasaar*, *Rasendra Sara Sangraha* (R.S.S.), *Rasa Kamdhenu* (R.Ka), *Ayurveda Prakash* (A.P.), *Yoga Ratnakar* (Y.R.), *Bhaishjya Ratnavali* (B.R.), *Rasa Tarangini* (R.T.), *Rasa Jala Nidhi* (R.J.N), *Rasa Chandanshu* (R.Cha), *Brihat Rasaraj Sundar* (B.R.R.S.) and *Rasamrita* (R.Am). Various research databases like PubMed, AYUSH Research Portal, Google Scholar were searched with specific keywords like *Heeraka*, *Hira*, *Vajra* and *Diamond* along with print journals, periodicals, and reports.

Observations

Gemstones in Sanskrit literature are mentioned as *Ratna*. Finest among the *Ratna* are categorized under *navaratna* which include nine different gemstones viz *Manikya* (Ruby), *Mukta* (Pearl), *Pravala* (Coral), *Pushparaga* (Topaz), *Tarkshya* (Emerald), *Heeraka* (Diamond), *Neela* (Sapphire), *Gomeda* (Zircon) and *Vaidurya* (Cat's eye). This categorization is unanimously followed by the later texts of Ayurveda and *Rasashastra*. Relation between various *graha* and *ratna* is a common finding in the literature and diamond has been related to *Shukra graha*. In many texts *Heeraka* is mentioned under various synonyms like *Vajra*, *Kulish*, *Bhidur*, *Manivara*, *Abhedhya*, *Chandra*, *Ratmadradha*, *Asira*, *Pavi*, *Idrayudha*, etc.⁸ Detailed descriptions about *Heeraka* from various texts are compiled as follows.

Samhita Granta

Author of *Kautilya Arthashastra* described the colour, types, desired qualities, valuation and *doshas* of *Heeraka*. In *Charak Samhita* *Mani* word has been used in various places but specifically *Heeraka* is internally used in treatment of *Kustha* (Cha.Chi. 7/73). It is used in *Sarpadansha chikitsa* as *Dharana* (Cha.Chi 23/252) *Acharya Sushruta* has mentioned the names of various *Mani* like *Mukta*, *Vidruma*, *Vajra*, *Vaidurya*, etc along with their properties (Su.Su.45/331). *Mani* is used as an external application in the form of *Lekhyanjana* for Ophthalmic disorders (Su.U. 12/24). *Ashtang Sangraha* mentioned a few formulations of *Heeraka* like *Vajrabhidhan Gutika*

(As.S.Chi. 18) in *Pandu Roga* and *Vajrapatra* in (As.S.Chi. 10) *Arsha Roga*. The Relationship between *Heeraka* and *Shukra Graha* was accepted by Brihat Samhita as well as Bhava Prakash. Many formulations of *Heeraka* like *Vajravataka Mandur* in *Panduroga*, *Shodhana* (Purification) and *Marana* (Calcination) process of *Heeraka* along with *Vatanashana rasa* in *Vatavyadhi* is mentioned by Acharya Sharandhara. Bhava Prakash mentioned *Heeraka* under the category of *Ratna*. *Shodhana*, *Marana*, Ill effects of unpurified *Heeraka* was also well described.

Nighantu

Madanpala Nighantu described synonyms, common properties and use of all *Ratna* in *Grahabadha* as *Pravaladi Gana*. Properties, type, and examination of *Heeraka* was well mentioned by Raj Nighantu. In Bhaishjya *Ratnavali* complete description about *Shodhana*, *Marana*, properties, use and dose of *Heeraka* is mentioned. Some formulations involving *Heeraka* are also mentioned.

Rasa period (Medieval Period)

Unlike Samhita texts, texts of *Rasashastra*, which in the early period was influenced by tantra, has an extensive literature regarding the use of metals and minerals for therapeutic purposes. Sources of diamond, characteristics of diamond for therapeutic use, their processing techniques including *Shodhana*, *Marana*, *satvapata* (Extraction of metal from its ore), *Druti* (Stable liquified state), method of administration along with dose adjuvants and therapeutic indications are elaborated in the texts.

A review of Tantric literature reveals that the use of metals was known in that period but it was kept with strict secrecy like mantras. It was Nagarjuna who advocated the use of metals and minerals in various forms in Rasa texts and thus the secrecy of their use was brought to an end.⁹ Rasendra Mangalam mentioned about 7 different methods of *Heeraka* and *Vaikrant drava* in chapter 2. Rasarnava in 6th patala mentions about the type, *Shodhana* (Purification), 16 different methods of *Marana* (Calcination), *Mridukarana* (Pharmaceutical process for brittleness) and *Dravikarana* (Pharmaceutical process to convert any material into its liquid form). In the 7th Patala he has mentioned the special use of *Heeraka* along with *Makshika* (Chalcopyrite) and *Abhrak* (Mica) for *Dehakarma*. Rasa Hridaya Tantra mainly deals with *Dhatu vada* and *Lauha Vada*, in context to *Heeraka*, *Vajrini Gutika* has been mentioned. Rasaprakash Sudhakar in chapter 7 described about the Type, Characteristics, *Shodhana*, *Marana*, *Vajra Potalli Rasayana*, *Vajra rasayana Shadgunaidhaprada*, *Vajra Rasayana*, *Bhasma Guna* of *Vajra*. Rasa Ratnakar dedicates a whole chapter for *Heeraka*, he has described the types, three different methods of *Shodhana* and twelve different methods of *Marana*. Unique pharmaceutical processes of *Vajrodana*, *Vajradwanda Melapana Vidhi* and *Vajra druti* were also mentioned. Anandkand chapter 7 *Padmaragadi Ratnautpati* describes *Heeraka* type, *Guna*, *Vajra sanskar*, *Vajra rasayana*, *Vajraodan*, *Vajradruti*, *Bhasma guna*. In chapter 9 few of *Heeraka* formulations like *Vajreshawar gutika* are mentioned. Further detailed descriptions of *Vajra shodana*, *Marana*, *Mrudukarana*, *Bandh* of *Heeraka* are also mentioned. Rasapadhati in the chapter named *Ratnaprakaan- ratanavargikarana* has mentioned about the origin of *Heeraka*, Type, *dosha*, *Mulya Nirdharan* (Price fixation), Ornament type, *Pariksha Mandali Ayogta*. Properties, *Shodhana*, *Marana*, comparative with *vaikrant* are mentioned by Rasa Manjiri in chapter 3. In chapter 1 of Rasendra Saar Sangrha *Vajra dosha*, *Shodhana*, *Marana* and *Guna* are mentioned. Rasa Kamdhenu mentions *Ratna* in general in chapter 2. Few formulations like *Bajrasundari*, *Vajrangasundari*, *Vajradigutika*, *Vjarakhechhari* were mentioned in chapter third. Rasamrutam has described a common verse of *Ratna Shodhana* and Individual method for *Heeraka Marana*, *Vajra Churnikarana* method has also been specified in this text. Brihad Rasa Raj Sundar has dedicated a separate chapter to *Heeraka*. Specification of Origin, *dosha*, Type, *Guna*, *Pariksha*, *Shodhana*, *Marana*, *Vikar shanti*, *Jati* wise *Marana* has also been mentioned. Pharmaceutical procedures like *Heeraka Mridukarana*, *Heeraka Druti* are also specified.

Rasendra Mangalam outlines seven distinct methods of *Heeraka* and *Vaikrant drava* in Chapter 2. Rasa Hridaya Tantra predominantly addresses *Dhatu vada* and *Lauha Vada*, with specific mention of *Vajrini Gutika* concerning *Heeraka*. In Chapter 7 of Rasaprakash Sudhakar, details regarding Type, Characteristics, *Shodhana*, *Marana*, *Vajra Potalli Rasayana*, *Vajra rasayana Shadgunaidhaprada*, *Vajra Rasayana*, and *Bhasma Guna* of *Vajra* are expounded upon. Rasa Ratnakar dedicates an entire chapter to *Heeraka*, elaborating on types, three distinct methods of *Shodhana*, and twelve methods of *Marana*. Unique pharmaceutical processes like *Vajrodana*, *Vajradwanda Melapana Vidhi*, and *Vajra druti* are also delineated. Anandkand Chapter 7 of *Padmaragadi Ratnautpati* delineates *Heeraka* types, *Gunas*, *Vajra sanskar*, *Vajra rasayana*, *Vajraodan*, *Vajradruti*, and *Bhasma guna*. Chapter 9 further discusses *Heeraka* formulations like *Vajreshawar gutika*, along with detailed descriptions of *Vajra shodana*, *Marana*, *Mrudukarana*, and *Bandh*. In the chapter titled *Ratnaprakaan- ratanavargikarana* of Rasapadhati, the origin of *Heeraka*, types, *dosha*, *Mulya Nirdharan* (Price fixation), Ornament type, *Pariksha Mandali Ayogta*, properties, *Shodhana*, *Marana*, and comparison with *vaikrant* are discussed. Rasa Manjiri in Chapter 3 mentions *Vajra dosha*, *Shodhana*, *Marana*, and *Guna* in Chapter 1 of Rasendra Saar Sangrha. Rasa Kamdhenu addresses *Ratna* in general in Chapter 2, with formulations like *Bajrasundari*, *Vajrangasundari*,

Vajradigutika, *Vjarakhechhari* mentioned in Chapter 3. Rasamrutam describes a common verse of *Ratna Shodhana* and Individual method for *Heeraka Marana*, along with the *Vajra Churnikarana* method. Brihad Rasa Raj Sundar dedicates a separate chapter to *Heeraka*, specifying its Origin, *dosha*, Type, *Guna*, *Pariksha*, *Shodhana*, *Marana*, *Vikar shanti*, and *Jati* wise *Marana*. Pharmaceutical procedures like *Heeraka Mridukarana* and *Heeraka Druti* are also specified.

Mythological Origin of Heeraka

Tantra Sara has clearly co related *NavRatna* with the humans. In the case of Diamond it is correlated with bones. According to Varahamihira, the origin of diamond was from the bones of Demon Bali, whereas according to Agni Purana Diamond originated from the pieces of the spine of Sage Dadichi that fell on the ground at four different sites originating to four mines of Diamond. Another story states that after churning the ocean of milk elixir was formed. In the quarrel between gods and Demons for the elixir, few drops fell on the earth giving rise to gemstones (B.R.R.S., R. Paddati). The last particle of the bone of Indrayudha, along with severed limbs and head of Bali, were converted into *Heeraka* (Garuda Purana). Garuda Purana is one of total eighteen Mahapurana, in which description of some of the valuable gemstones, their test of genuineness, characteristics and testing methodologies has been told in detail in form of dialogue between *Suthamahamuni* and *Saunaka* in 68th chapter of *Acharya Khanda*.¹⁰

Geographical Source of Vajra

From ancient times, India was the only source of nearly all the world's known diamonds, until the discovery of diamonds in South Africa in 1854 until the end of 2019, Africa has produced almost 3.6 billion carats (Bct) of diamonds out of a total global production of some 5.9 Bct (updated from de Wit et al. 2016). With the combined production of placers and paleo- placers from South America, India, Australia and Siberia it is estimated that close to 1.5 Bct (or just over 25% of the global production), have come from these deposits.¹¹ As of now, there is one industrial-scale diamond mine in India, the Majhgawan mine, near the town of Panna, Madhya Pradesh.

In classical texts, place of origin according to Yuga was also mentioned as follows *Satyuga-Kaushaladesha*, *Kalingadesha*; *Tretayuga-Vanga Desha*, *Malava Desha*; *Dwaparyuga-Saurashtra Desha*, *Manipundrak* (Manipur); *Kaliyuga-Soparaka*, *Vajrakar*.¹² The eight regions or divisions of the country in which diamond-crystals of varied shapes germinates - are the *Himalayas*, the *Matangas*, the provinces of *Anga*, *Saurashtra*, *Poundra*, *Kalinga*, *Koshala*, the basin of the river *Venna*, and the country of the *Souveras*.¹³ Similar reference of eight diamond mines with their adjacent colour was found in *Anandkanda* - *Poundra- Shyama* (Black), *Matang parvata - Pita* (Yellowish), *Himalaya* and *Saurashtra- Tamra* (Copper like), *Sopara Desha - Krishna* (Black), *Koshala- Shirish Pushpa saman* (Yellowish), *Kaling- Swarna Prabha* (Gold like), Basins of river *Purna- Chandrma saman shweta* (Moon like whitish).¹⁴

Types of Heeraka

Based on colour, diamonds are classified into white (colourless), yellow, brown, green, orange, blue, pink, grey, black or red depending on the presence, type and quantity of impurities or structural defects.² Four types of *Heeraka* according to Raj Nighantu are *Shweta*, *Lohita*, *Pitaka* and *Mechaka*. Another classification is *Purusha vajra* (Male), *Stree vajra* (Female) and *Napunsaka vajra* (Impotent) are also found in the *Rasagranta* among which *Purusha Vajra* is considered to be the best variety. *Purush Heeraka* possesses characteristics such as *Ashtasara* (Eight edges), *Ashtaphalaka* (Eight surfaces), *Shatkona* (Six angles), *Atibhasur* (Shining), *Ambu saman* (Like water), *Indradhush varna* (Exhibits colours like rainbow), *Suvrut*, *Tejoyukta* (Bright), *Brihat* (Large)¹⁵, *Rekha Bindu Varjita*¹⁶ and shows properties like *Rasabandhkara* (Helps to bind mercury), *Ashta Sidhidayaka* (Eight benefits), *Rasayankara* (Rejuvenator).. *Stree (Female) Heeraka* are *Chipitakar* (Flat surfaced), *Vartulayatam* (Round), *Rekha Bindu Yukta* (Along with line and dots)¹⁷ In structure while ingestion shows qualities like *Dehasidhikar*, *Bhoga*, *Kanti* (Splendour), *Sukha prada* (Happiness). *Napunsaka* (Impotent) show characteristics like *Vartula* (Round), *Kutakonagra* (Broken edges), *Trikona* (Three angles), *Sudirgha* (Very long)¹⁸ and on ingestion show properties like *Kramana* (Kama+),

Shinasatva(reduced will power), *Alpavirya*(Low potency). Characteristics according to *Jati*(Caste) were also described in our classics viz Brahmana-Sphatika/Shweta (White), Shatriya-Rakta (Red), Vaishya- Pita (Yellow), Shudra- Krishna (Black) .6 Types according to origin was also mentioned by Kautilya Arthshastra which were as follows- *Sabharashtrakama*, *Madhyam Rashtrakam*, *Kashmir Rashtrakam* *Shreekatnak Rashtrakam*, *Manimantak Rashtrakam*, *Indravanaka*.

Dosha of Heeraka

Five *doshas* are generally associated with *Ratna* viz *Graas*(black-colored part), *Traas*(two different colors), *Bindu*, *Rekha* and *Jal Garbhata*(haziness). Similar *doshas* are also observed in *Heeraka*.¹⁹ *Rekha* (lined appearance) and *Bindu* (dotted appearance) are among these five *doshas*, each further categorized into four types according to B.R.R.S. These two *doshas* are acknowledged by B.R.R.S. and R. Paddati. Additionally, B.R.R.S. substitutes *Gaad dosha* for *Graas dosha*. R. Paddati identifies *Kakpada* , *Yava*, and *Mala dosha*.

Shubhashubha/Grahya Agrahya

While discussing the various types of diamond, classical texts of *Rasashastra* also mention *Grahya* and *Agrahya Heeraka* i.e. diamonds which are having desired characteristics for therapeutic use and those which are having undesired characteristics.

Grahya lakshana described in Garuda purana states that Diamonds found in the region of the Gods are supposed to be clear, light shade, smooth and even at the sides, and devoid of the traits such as scratches, dot like impressions, marks of crows feet, or clouding impurities in its interior. A diamond, weighing twenty *tandulam* in weight, should be regarded as double in value of the standard. Fractions such 1/3, 1/6, 1/10, 1/15, 1/80 or 1/100 should respectively be used in computing the price of a diamond.²⁰ *Grahya Lakshana* such as *Ashtangyukta*(Eight surfaces), *Shatkona* (six angles), *Tikshana Dhara*(Very sharp), *Sunirmala*(Very clean) were mainly accepted by all the acharyas. *Laghu*(Light weight) was stated by B.R.R.S as well as R.P whereas *Snigdha* (Smooth) and *Vidhyudhvibhm* (Electric Potential) was mentioned by R.T.

Agrahya qualities were as follows: Eight seeds of white sesamum equal a Tandulam in weight, and the use of a diamond weighing less than standard-measure, is prohibited.²¹ *Vartula/Gola* (Circular), *Maleena* (Dirty), *Neela* (Bluish), *Bhutyabham* (Greyish colour) , *Sphutitam* (Broken edges), *Kharama* (Rough), *Sakapada* (Crow's feet), *Rekha* (Lined appearance)²², *Bindu* (Dotted appearance), *Rukhsa* (Dry), *Cheepeta* (Flat surface), *Bhasma ranga* (Colour of Ash) , *Trikona* (Three angles)²³

Shodhana(Purification) of Heeraka

All metals and minerals described in the Rasagranta are subjected to certain processing techniques called as *Shodhana* before they are used therapeutically. *Shodhana* is an important pharmaceutical procedure to reduce toxicity and enhance the potency of the drug. It involves different methods like heating and quenching in different herbal juices, frying, roasting, trituration etc. *Shodhana* methods prescribed for *Heeraka* in various Rasagranta are depicted in Table no.1

Table 1: Different methods of Vishesha Shodhana of Heeraka as per different classics

S.No.	Reference	Drug used	Procedure
1	B.R.R.S	<i>Vyaghrikand, Kodrava Kwatha</i>	A. <i>Heeraka</i> in between <i>Vyaghrikand</i> and <i>swedana</i> (Boiling) in <i>kodrava kwatha</i> for seven days
2	B.R.R.S	<i>Kulatha kwatha, Any Kanda</i>	<i>Swedana</i> for 1 prahar
3	B.R.R.S	<i>Kulatha kwatha, Kodrava Kwatha, Vyaghrikand, Ashvamutraa, Tuhar guddha</i>	A. <i>Swedana</i> in <i>kulatha</i> and <i>Kodrava Kwatha</i> B. Place <i>Heeraka</i> inside <i>Vyagrikand</i> - Do <i>Kapadmiti</i> (Mud smeared cloth)- Give puta for a night C. <i>Nirvapa</i> in <i>Ashvamutra</i> and <i>Arka dugdha</i>
4	B.R.R.S	<i>Vyagrikand, Ashvamutra</i>	A. <i>Heeraka</i> inside <i>Vyagrikand</i> - <i>Lepa</i> with Buffalo dung- Heat for prahar B. <i>Nirvapa</i> (Heating and Quenching) 7 times in

<i>Ashvamutra</i>			
5	R.Am.8/10	<i>Kulatha Kwatha</i>	<i>Swedana</i> 1 prahar
6	R.Cha, R.P.S	<i>Kulatha Kwatha/Kodrava Kwatha</i>	<i>Swedana</i> for 3 hours
7	R.Chu	<i>Kantakari Mula, Ashva Mutra</i>	A. <i>Lepa</i> of <i>Kantkari mula- Puta</i> (7) B. <i>Nirvapa</i> in <i>Ashva mutra</i>
8	R.Mn 3, R.S.S	<i>Vyaghrikanda, Kodrava, Kulatha</i>	Place <i>Heeraka</i> in the middle of the <i>vyaghrikanda- Swedana</i> in <i>Kulatha kwatha/ Kodrava kwatha</i> for 7 days
9	R.R.S.	<i>Kulatha Kwatha</i>	<i>Swedana</i> for 3 hours
10	R.S.S	<i>Vyaghrikanda, Ashva mutra/ Vajri ksheer</i>	A. Place <i>Heeraka</i> inside <i>Vyagrikand- Kapadmitti- Puta</i> B. <i>Nirvapa</i> in <i>Ashva mutra/ Vajri Ksheer</i>
11	Sh.M.11/79	<i>Kantkari Moola, Kulatha Kwatha</i>	Place <i>Heeraka</i> in <i>Kantkari Moola Kalka- swedana</i> in <i>Kulatha Kwatha</i> for 3 days

Marana (Incineration) of Heeraka

Shodhana is followed by the process of *Marana*. This pharmaceutical process is necessary to reduce the particle size of the drug and make it suitable for internal administration. Different incineration methods mentioned for *Heeraka* in different texts are compiled and depicted in Table no.2

Table 2: Different methods of preparation of Heeraka Bhasma

S.No.	Reference	Drug Used/ Media	Procedure
1	B.R.R.S	<i>Karpas Mula, Nagavela Beej</i>	Place <i>S. Heeraka</i> in either of the two media- 7 times mud smeared <i>Sharava</i> (Earthen saucer) - <i>Gajputa</i> (7)
2	B.R.R.S	<i>Khar Mutra, Harital, Khatmal Rakta,, Ashvamutra</i>	A. <i>Nirvapa</i> 21 times in <i>Khar Mutra</i> B. <i>Harital+ Khatmal Rakta</i> mixture- <i>Heeraka</i> placed in between and given <i>puta</i> C. <i>Nirvapa</i> 21 times in <i>Ashvamutra- Shanksheetanshu Pandur Bhasma</i>
3	B.R.R.S	<i>Khatmala Rakt, Kasmarda Swarasa</i>	<i>Lepa</i> of <i>Khatmal Rakta- Nirvapa</i> in <i>tamra</i> vessel filled with <i>Kasmarda Swarasa- Repeat</i> 100 times
4	B.R.R.S	<i>Neeljyoti Lata Kand</i>	Place inside the <i>Neeljyoti Lata Kand</i> and let it dry- Give required heat
5	B.R.R.S ,Sh.M.11/84 , Ra.Chi./7	<i>Hingu, Saindhava, Kulatha Kwatha</i>	<i>Nirvapa</i> for 21 times
6	R. Am.	<i>Rasasindur, S. Hartal, S. Manshila, S. Gandhak, Kulatha Kwatha</i>	Prepare bolus of <i>Heeraka</i> using these drugs- Place it in <i>Sharava- Mud</i> smearing- <i>Gajputa</i> - (14)
7	R.Cha	<i>Karpasa Mula, 3 yrs old Nagvalli</i>	<i>Bhavna</i> of each <i>swarasa</i> individually- <i>Golak- Gajaputa</i> (7)
8	R.Cha	<i>Khar Mutra, Matkuna Rakta, Haritala, Ashva Mutra</i>	A. <i>Nirvapa</i> 21 times in <i>Khar Mutra</i> B. <i>Mardana</i> with <i>Matkuna Rakta and Haritala- Golak- Puta</i> C. <i>Nirvapa</i> for 21 times in <i>Ashva Mutra</i>
9	Ra.Chi./7	<i>3 yrs old Nagvalli, Karpasa, Mulika</i>	Place <i>Heeraka</i> in middle of the <i>Kalka</i> (Paste)- Give <i>Putra</i> (7)
10	Ra.Chi./7	<i>Manduk Mutra</i>	<i>Nirvapa</i> several times
11	R.Mn 3, R.S.S	<i>Manduk mutra</i>	<i>Nirvapa</i> in <i>Kansya patra</i> (Copper vessel) filled with <i>manduka mutra</i> for 21 times
12	R.Mn 3, R.S.S	<i>Karpasa Mula, 3 yrs old Nagvalli</i>	Place <i>Heeraka</i> in middle of the <i>Kalka- Give Gajaputa</i> - 7 times
13	R.R.S.4/ 38	<i>Kulatha Kwatha, Lakucha Phal Swarasa, Manshila, Parada</i>	A. Give <i>Bhavna</i> with <i>Kulatha kwatha. Lakucha Swarasa</i> and <i>Manshila lepa</i> inside <i>musha- Gajaputa</i> (8 times) B. <i>Nirvapa</i> in <i>Parada</i> 100 times

14	R.R.S. 4/41	<i>Khatmala Kasamarda swarasa</i>	<i>Rakta, Lepa of Khatmala rakta on Heeraka for 7 times- Nirvapa in Kasamarda Swarasa for 7 times</i>
15	R.R.S.4/43	<i>Neeljyothi Kanda</i>	<i>Bhavna of Neeljyothi Kanda- Puta</i>
16	R.R.S.4/44	<i>Madanphala, Earthworm</i>	<i>Lepa of the kalka on Heeraka- Puta (20)</i>
17	Sh.M.11/85	<i>Manduk Mutra</i>	<i>Nirvapa several times</i>

Properties of Heeraka Bhasma

Heeraka Bhasma is said to be *Shadrasa yukta*(Six taste), *Hima*(Cool) in nature ²⁴and *Tridoshashamaka*(Pacifies three *doshas*)²⁵ according to Anandkanda. Properties and indications of *Heeraka Bhasma* as mentioned in the classical literature is depicted in Table no.3

Table 3: Properties of Heeraka Bhasma as per different classics

S.No.	Properties	B.R.R.S.	R.R.S.	R.T.	Ra.Chi	R. Cha	R.P.S.	A.K.
1	<i>Ayushya</i>	+	+	+	+	+	+	+
2	<i>Vrishya</i>	+	+	+	+	+	+	
3	<i>Tridoshashamak</i>	+	+	+		+	+	+
4	<i>Amayaghna</i>	+	+					+
5	<i>Sutendrabadha</i>	+	+				+	
6	<i>Agnidipti</i>	+	+			+		
7	<i>Mrityunjayet</i>	+	+			+		+
8	<i>Amritsaman</i>	+	+	+		+	+	
9	<i>Shadrasa</i>	+		+				+
10	<i>Sarvaroghar</i>	+			+	+		
11	<i>Sarvapaaphara</i>	+						
12	<i>Dehadrikar</i>	+						+
13	<i>Rasayana</i>	+		+				+
13	<i>Aayu Virya Pushti</i>	+						
14	<i>Varnya</i>	+		+	+			
15	<i>Sukhkar</i>	+			+			+
16	<i>Hridya</i>			+				
17	<i>Yogvahi</i>			+				
18	<i>Rajyakshma</i>			+				
19	<i>Mehanashana</i>			+				
20	<i>Medonashana</i>			+				
21	<i>Pandu</i>			+				
22	<i>Shotha</i>			+				
23	<i>Udar Roga</i>			+				
24	<i>Balya</i>			+	+			
25	<i>Medhya</i>			+				
26	<i>Parada Bandak</i>					+		
27	<i>Parada Gunavardaka</i>					+		
28	<i>Hima Virya</i>							+

Dose and Adjuvant

Different doses are mentioned for internal administration of *Heeraka Bhasma* in different texts. The dose of *Heeraka Bhasma* varies from 1/100 *Ratti* (1.25 mg) and 1 *Ratti* (125 mg) in *Rasa* classics.²⁶²⁷ *Rasarnava* advocate the use of *Heeraka Bhasma* up to seven pala while *Rasatarangini* mentioned the dose as 1/32 1/16 *ratti*(4-8mg).

The dose mentioned by *Rasatarangini* seems to be more practical in case of therapeutic efficacy as well economic feasibility of the patient. *Heeraka Bhasma* is clinically used in many challenging disorders by *Ayurveda* practitioners. Adjuvant of *Heeraka Bhasma* is *Madhu*, *Ghrit* and *Dugdha*. Disease wise adjuvant in addressing

Vatavyadhi (conditions linked to *Vata dosha*) and *Vatarakta* (gout) comprises of *Adhraka rasa* (ginger juice) paired with Honey. When managing *Kasa* (respiratory disorders like cough) and *Swasa* (asthma), the adjuvant of choice encompasses *Adhrak rasa* combined with *Maricha* (black pepper), *Dalchini* (cinnamon), and *Pippali* (long pepper). To alleviate symptoms of *Pitta* (pertaining to heat) and *Daha* (sensations of burning), the adjuvant incorporated is *Mishri* (rock sugar), whereas in treatment of *Jwara* (fever), the adjuvants utilized consist of *Guduchi* (*Tinospora cordifolia*) and *Chirayta Kashaya* (*Swertia chirayita* decoction).²⁸

Untoward effects of *Heeraka bhasma*

Classical texts of *Rasashastra* has also discussed the untoward effects of *Bhasma* which occurs either due to improper methods of preparation or administration. Untoward effects of *Heeraka Bhasma* include *Kushta* (Skin disease), *Hritparshvapida* (Pain near heart and flank region), *Tapa* (Heat), *Pandu* (Pallor), *Gurutva* (Heaviness) and many other problems (Table no.4). Treatments/Antidotes to pacify the ill effects produced by improperly prepared *Heeraka Bhasma* includes *Sita* (Sugar), *Madhu* (Honey), *Ghrit* (Ghee), *Dugdha* (Milk)²⁹

Table 4: Untoward effects of *Heeraka bhasma*

Doshas	B.R.R.S.	R.T.	Ra.Chi.	R.Chi	R.Mn	R.S.S
<i>Kushta</i> (Skin Disease)	+	+	+	+	-	-
<i>Hritparshvapida</i> (Pain in regions around Heart and Flank)	+	-	-	-	-	-
<i>Parshvavyatha</i> (Pain in Flanks)	+	+	+	+	+	+
<i>Pandu</i> (Pallor)	+	-	+	+	+	+
<i>Tapa/Daha</i> (Heat)	+	+	+	+	+	+
<i>Gurutva</i> (Heaviness)	+	-	+	+	+	+
<i>Bhrama</i> (Giddiness)	-	+	-	-	-	-
<i>Kilasa</i> (Hypopigmentation)	-	-	-	-	+	-
<i>Hrulasa</i> (Nausea)	-	-	-	-	-	+

Use of Diamond in Mercurial processing

Earlier texts of *Rasashastra* has given emphasis to both *Lohaveda* and *Dehaveda* concepts where potentiating Mercury by performing *Ashtadasha samskara* was considered the primary aim. Many metals and minerals were processed and utilized in the various steps of *samskara*. Formulations like *satva* (Extraction of metal from its ore), *druti* (Stable liquefied state of metal/mineral) etc were used for this purpose. References are found in the literature regarding preparation of *Heeraka satva*, *druti*, etc which were utilized for the purpose. However these forms were used very rarely for therapeutic purposes.

For preparing *Heeraka satva* following steps have to be followed. *Heeraka Bhasma* along with *Tankan*, Melted *Bhunagsatva* and *Suvarna* are taken in equal quantity. The above mixture is given extreme heat to the point where *satva* is obtained³⁰. Pharmaceutical details for *Mridukarana* and *Druti* of *Heeraka* are mentioned in Table no 5-6 respectively.

Table 5: Different methods for *Mridukarana* of *Heeraka*

Reference	Drug Used	Procedure
B.R.R.S.	<i>Matulunga</i> , <i>Nagvelli</i>	Place <i>Heeraka</i> in <i>Matulunga</i> - Mud smearing- dried- 100 <i>Putra</i> - Cover <i>Heeraka</i> in <i>Nagvelli rasa</i> - Cover with <i>Nagvelli patra</i> - Place inside the ground for a few days.
R.Am.	<i>Sudha Ksheer</i> , <i>Kulath Kwatha</i> , <i>S. Parada</i>	<i>Nirvapa</i> 100 times
R.R	<i>Matulunga</i> , <i>Nagvelli Swarasa</i>	A. Place <i>Heeraka</i> in middle of <i>Matulunga</i> - Mud smearing- Several <i>Putra</i> B. <i>Mardana</i> of <i>Heeraka</i> with <i>Nagvelli Swarasa</i> - Wrap <i>Heeraka</i> around <i>Nagvelli Patra</i> - Press it under Knee for 3 hours
R.R	<i>Parada</i> , <i>Tikshna Churna</i> , <i>Amla varga</i> , <i>Nagvelli Patra</i>	A. <i>Mardana</i> of <i>Parada</i> , <i>Tikshna Churna</i> along with <i>amla Varga Dravya</i> - <i>Gola</i> - Place <i>Heeraka</i> in the middle- Tie it properly- Place

		inside Nagvelli Swarasa- Keep inside Dhanya for 1 month
		B. Wrap Heeraka around Nagvelli Patra- Press it under Knee for 3 hours
R.R	Eranda Vriksha, Nagvelli Patra	A. Place Heeraka inside Eranda plant for a month
		B. Wrap Heeraka around Nagvelli Patra- Press it under Knee for 3 hours

Table 6: Different method for preparing Heeraka Druti

Reference	Drug Used	Procedure
A.K.	<i>Trikshaar, Chanakamla, Hingu, Amlavetas, Jwalmukhi, Ekshuraka, Stalakumbhi swarasa, Snuhiksheera, Arka ksheer, Jambhir swarasa</i>	-Prepare Kalka by mixing Trikshaar to Arka Khseer- Place Heeraka in middle- Place the bolus inside Jambhir swarasa for swedana for 3 days
B.R.R.S.	<i>Vajravali (Cissus quadrangularis), Amla varga</i>	Place Heeraka inside Vajravalli - Heat given- swedana for 7 days in Amla Varga drava- Druti like Parada
R.Ma	<i>Kantashma, Meshashruna, Gandhak, Shilajatu, Kshartraya, Hartala, Snuhi, Arka Ksheer</i>	Mix the drug with Heeraka- Chakrika- Puta- Then add Kulatha and Kodrava churna to Ashva Mutra - Nirvapa till Bhasma formation
R.Ma	<i>Varuni, Meshashringi, Vajravalli, Mahodadhi, Paravatavishta, Rat faeces, Trikshaar, Panch Upkshaar, Vajri and Arka Dugdha</i>	Mix the drug with Heeraka- Chakrika- Puta- Then add Kulatha and Kodrava churna to Ashva Mutra - Nirvapa till Bhasma formation
R.Ma	<i>Asthishrukla</i>	Add Heeraka in the middle of Asthishrukla- Pottali- swedana in Water for 7 days.
R.R	<i>Vajravalla</i>	Place Heeraka inside Vajravalla- Place Vajravalla inside water and boil it for 7 days
R.R	<i>Amlavetas</i>	Place Heeraka inside Water mixed with Amlavetas for 7 days- Then remove and give puta

Diamond in Contemporary Scientific literature

A search through contemporary scientific literature has revealed the use of diamond in the form of nanoparticles in a wide array of platforms including biotechnology and biomedical science. Nanodiamonds, with crystal grains less than 100 nm possess greater surface area which further offers a wide range of functionalization, high capacity for adsorption and enhanced biocompatibility³¹. A renewed interest in the use of nanodiamonds in the medical field is a recent trend. Studies have reported the application of nanodiamonds in tumour killing³². Use of nanodiamonds as antibacterial particles has also been studied³³. Potential of nanodiamonds in the diagnosis and treatment of neurological diseases is also being explored³⁴.

Though the majority of scientific studies were carried out on nanodiamonds and their applications a few studies also reported the structural characterization as well as therapeutic use of traditionally prepared *Heeraka Bhasma*.

Heeraka Bhasma ((Ayu_ND) prepared by the reference of R.R.S. was tested to see an impact on direct antitumor activity. Ayurvedic nanodiamonds truly initiate an overwhelming tumoricidal immune response against highly metastatic lymphoma with poor prognosis, causing rapid death.³⁵ *Heeraka Bhasma* nanoparticle (HBNP) showed an excellent antitumor activity in vivo followed by developing healing characteristics due to oxidative stress. All these findings strongly suggest that HBNP has the potential to be the new cancer therapeutic.³⁶

DISCUSSION

The utilization of *Heeraka* (Diamond) in Ayurvedic pharmaceuticals, particularly in the form of *Heeraka Bhasma*, opens up intriguing avenues for exploration and debate. Its classification under *Ratna Varga* and its association with gems classification in classical Ayurvedic texts establish its deep-rooted connection with ancient medicinal practices.

A search through classical texts reveals that extensive literature about *Heeraka*, its geographical origin, types etc were known to the people of ancient India. It was valued as a precious gemstone and was traded from ancient India to various countries. Earlier references in texts like *Brihat Samhita* point towards its spiritual connotations and healing property as a wearable rather than its therapeutic potential. It was in *Charaka Samhita* that first reference for internal administration of *Heeraka* was mentioned in the treatment of integumentary diseases but the form of *Heeraka*, its therapeutic dose etc were not mentioned in the text. Later the period from 8-16 th century marked as the golden period of *Rasashastra*, witnessed the elaborate use of metals and minerals in therapeutics. *Rasashastra* texts contain ample references for the various processing techniques for purification and incineration of *Heeraka*. All the process has been meticulously dealt with within these texts including the dose, therapeutic indications, untoward effects of improperly prepared *Bhasma* and their treatment modalities.

Among the various *shodhana* methods mentioned in various texts *nirvapa* and *swedana* are the common methods found. For *Bhasma* preparation *gajaputa* is mentioned in most of the references. The meticulous descriptions of *Shodhana* (purification), *Marana* (incineration), and specific pharmaceutical processes highlight the importance of quality control and standardization in Ayurvedic medicine. The media used in the purification process has a very important role in either breaking down or destroying the chemical constituents that are not required. The heat treatment of the drug in a particular media for a particular duration has a role in the modification of the chemical constituents, etc. Media has an important role in making a drug act without causing any side effects.³⁷ The distinction between *Purusha*, *Stree*, and *Napunsaka* varieties based on gender reflects the traditional Ayurvedic approach to individualized treatment strategies tailored to specific physiological differences. The detailed descriptions of the characteristics associated with each type of *Heeraka* highlight the intricate observations made by ancient scholars regarding its physical attributes and medicinal properties. The reverence accorded to *Purush Heeraka* for its superior qualities, contrasted with the perceived inferiority of *Napunsaka Heeraka*, reflects the hierarchical classification system prevalent in Ayurvedic pharmacology.

Shubhashubha or *grahya agra* delineates the desirable and undesirable qualities of *Heeraka*, guiding practitioners in discerning its suitability for therapeutic use.

Heeraka Bhasma *guna* outlines the pharmacological properties of *Heeraka Bhasma*, emphasizing its multifaceted therapeutic potential and cooling nature. The enumeration of over 30 different *guna-karma* underscores the diverse therapeutic applications of *Heeraka Bhasma* in Ayurvedic practice, ranging from pacifying *doshas* to promoting longevity and vitality. The dose variability and disease-specific adjuvants underscore the individualized approach to treatment in Ayurveda, tailored to the unique needs and conditions of patients.

Ashudha Heeraka dosha highlights the potential risks associated with improperly prepared *Heeraka Bhasma*, necessitating remedial measures to mitigate adverse effects. The recognition of adverse effects underscores the importance of quality control and adherence to standardized procedures in the preparation of *Heeraka*-based formulations.

CONCLUSION

The present review highlights the historical use of *Heeraka* for various ailments. The meticulous methodologies for *Shodhana* and *Marana* prescribed by classical texts underscore the importance of precision and adherence to established protocols in the preparation of *Heeraka*-based formulations. The utilization of *Heeraka Bhasma* for various ailments such as internal abscesses, tumors, cancer, angina pectoris, and tuberculosis underscore its perceived therapeutic value in traditional medicine. One of the most fascinating aspects is its purported use in boosting the immune system to combat cancer, as mentioned in both ancient Ayurvedic texts and contemporary medical applications. The transition from traditional to modern medicine, where diamond nanoparticles are being explored for medical purposes, indicates a convergence of ancient wisdom and modern scientific inquiry. The current review emphasizes the relevance and potential of *Heeraka* as a nanotherapeutics which can be further explored.

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