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Comprehensive Appraisal on *Shodhana* Methods of Precious Gemstone: *Vajra* (Diamond)

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Abstract

Introduction: The *Vajra* (diamond) is mentioned under *Ratna* classification in Ayurveda classics. In *Ayurvedic* practice; *Vajra Bhasma* used for treating challenging diseases, that is, tumor (*Arbuda*), etc. In the market also, it is available easily. However, data for *Vajra Shodhana* (purifying process) or *Marana* (process of making *Bhasma*) have not been compiled till date. Hence, here, an attempt has been carried out to compile the data for *Vajra Shodhana* from different classical texts. **Objective:** The objective of the study was to formulate inclusive data of *Vajra Shodhana* recorded in various *Ayurvedic* texts. **Data source:** This review reveals the *Shodhana* methods and *Shodhana* media which comprise 49 various books, that is, Samhita, Chikitsa Grantha, Rasa Grantha, and e-Nighantus also referred for review. **Review Methods:** Information collected on knowledge of *Vajra Shodhana* from classical texts through the index of the same by searching word "*Hiraka Shodhana*," "*Vajra Shodhana*," and "*Ratna Shodhana*." Briefly, chapters were referred for a gathering of data. **Conclusion:** It is observed that about 34 methods for *Vajra Shodhana* are used in classics. Among this mainly, all methods are divided into five basic principles behind that classification. *Swedana* (giving heat by suspension of the drug in liquid)-*Nisechana* (immersion of heated solid in liquid) are the single processes used for *Shodhana*. Rest three methods are a continuous process.

Keywords: Ayurveda, Diamond, *Hiraka Shodhana*, *Ratna*, *Vajra*

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Introduction

Vajra (diamond) is extensively elaborated under classification of *Ratna Varga* (gems classification*)* in classical texts of Ayurveda.[1] In Rasa classics, it is mentioned with various synonyms such as *Kulisha*, *Hiraka*, *Abhedya*, *Chandra*, and *Bhidhura*.[2] The name itself indicates the drug which cannot be easily breakable. Types of diamonds are mentioned as male (*Nara)*, feminine *(Naree)*, and impotent (*Napushaka)* according to its taste (*Rasa)*, a nomenclature based on potency or properties *(Veerya*) and biotransformed (*Vipaka*). Male diamond (*Nara Vajra)* is mentioned best among all types.[3] According to color, the types of diamonds are white (*Shveta*), yellow (*Peeta*), red (*Rakta*), and black (*Krushna*). Characteristics of natural diamond (*Prakrutika Vajra)* are described briefly in Rasaadhyaya text.[4] The diamond is soft to touch *(Snigdha*), lustrous like that of electricity (*Vidhyutabham*), clean looking *(Swachha*), very hard and unbreakable (*Alekhya*), very sharp (*Tikshna*), and possess six angles and eight surfaces (*Shatakona*, *Ashtashtra*); such a sample of diamond is considered the best variety and is selected for pharmaceutical purpose.[5] In classics, it is indicated for diseases of *Vata* and *Pitta Dosha*, emaciation (*Shosha*), depletion (*Kshaya)*, giddiness (*Bhrama*), fistula in ano (*Bhagandara*), frequent and excessive micturition (*Meha*), aggravation of fat *(Meda)*, pallor (*Pandu*), diseases of abdomen/clinical features of Ascites (*Udara*), swelling (*Swayathu*), and infertility (*Napusankata*).[6] In the market, incinerated diamond (*Vajra Bhasma)* is available of different well-known pharmacies, namely, Patanjali, Dhootapapeswara, Baidhyanath, etc.[7] Market value of 100 mg *Vajra Bhasma* is varying up to 526–1005 rupees. In routine practice, it is used for cancer, strengthens the kidney and reproductive system, boosting the metabolic system of the body and provides stamina, energy, and gives fulfillment by enhancing manly power.[8] Properties of incinerated diamond are providing longevity (*Ayshaprada*), aphrodisiac (*Vrushya*), subside all *Doshas (Doshatraya Prasamana*), subside all the diseases (*Sakalmayghanam*), bind mercury (*Sutendrabandha*), beneficial for the body (*Sadgunakruta*), and wins against death (*Mrutyujayet)*.[9] The monograph of diamond (*Vajra)* has not been published or included in the Ayurveda Pharmacopoeia of India till date. Accordingly, exploration of *Vajra* in regard to its pharmaceutical process is a necessity part of Ayurveda research as requiring for basic knowledge for pharmaceutical company and Ayurveda research scholars. *Shodhana* (purifying process) is the process that eliminates physical impurities and made the material assimilable for further pharmaceutical procedure, that is, process of making *Bhasma* (*Marana*).[10] *Vajra Bhasma* is clinically used in many challenging disorders by Ayurveda practitioners. The dose of *Vajra Bhasma* varies from 1/100 *Ratti* (1.25 mg) and 1 *Ratti* (125 mg) in Rasa classics.[11,12] Consequently, here, an attempt has been made to collect all the references of purifying process methods of *Vajra Shodhana* from the different classical texts. Accordingly, one can use this data for the pharmaceutical exploration of *Vajra*.

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Materials and Methods

In this review; information pertaining from Bruhadtrayi, Laghutrayi, Chikitsa Grantha, compiled books, Rasa texts, and e-Nighantus are compiled. The books referred in this attempt are Charaka

Samhita,[13] Sushruta Samhita,[14] Ashtanga Hridya,[15] Ashtanga Samgraha,[16] Kashyapa Samhita,[17] Sharangdhara Samhita,[18] Bhela Samhita,[19] Harita Samhita,[20] Bhavaprakasha Samhita,[21] Chakradatta,[22] Bhaishajya Ratnawali,[23] Yoga Ratnakara,[24] Yoga Tarangini,[25] Siddha Bhaishajya Manimala,[26] Basavarajyam,[27] Anupana Manjari,[28] Ananda Kanda,[29] Ayurved Sara Samgraha,[30] Sahastrayogam,[31] Rasendramangala,[32] Rasahridyatantra,[33] Rasarnava nama rasatantrama,[34] Rasendra Chudamani,[35] Ayurveda Prakasha,[36] Rasa Ratnakara (Rasa Khanda, Vruddhi Khand),[37]Rasa Prakash Sudhakara,[38] Rasa Ratna Samuchaya,[39] Rasapaddhati,[40] Rasa Chintamani,[41] Rasamanjari,[42] Rasa Sanket Kalika,[43] Rasendra Chintamani,[44] Rasendra Sara Samgrha,[45] Rasa Kaumudi,[46] Rasa Kamdhenu,[47] Arka Prakasha,[48] Brihat *Rasa*raj Sundara,[49] Rasaraj Mahodadhi,[50] Rasayanasara,[51] Rasa Jala Nidhi,[52] Rasopnisat,[53] Rasamritam,[54] Rasatarangini,[55] Rasendra Sambhava,[56] Rasayana Sara,[51] Rasa Tantra Sara evam Siddha Yoga Samgraha,[11] Rasa Bindu,[57] Rasa Chandhanshu,[58] Rasoddhara Tantra,[59] and Anupana Tarangini,[60] have been compiled. e-Ninghantu,[61] such as Ashtanga Nighantu, Kaidev Nighantu, and Chamatkar Nighantu, have been compiled. In above-mentioned texts are analyzed with respect to *Vajra Shodhana* methods, media used for *Shodhana*, duration of *Shodhana* and principle of *Shodhana,* etc.

Process

Information collected on knowledge of *Vajra Shodhana* from classical texts through the index of the same by searching key words "*Sarva Ratna Shodhana,*" "*Hiraka Shodhana*," and "*Vajra* Shodhana." Briefly, chapters were referred for a gathering of data. Data on *Rasapanchaka* of drug used for *Shodhana* process were collected from Nighantu. Chemical constituents and bioactivities of *Shodhana Dravya*s were searched from the reputed journal by their Latin name. Detailed observations were summarized and tabulated.

Inclusion Criteria

Following particulars are included from classical texts and Nighantu.

1. Principle of *Vajra Shodhana*
2. Media used for *Vajra Shodhana*
3. Duration required for *Vajra Shodhana*
4. *Rasapanchaka* of *Shodhana Dravya*
5. Chemical constituents and their bioactivities of *Shodhana Dravya*.

Aim of *Vajra Shodhana*

Vajra is the name itself shows the hard nature of the drug. The first obstacle in the consumption of material by humans is its non-edibility due to its hard consistency. Hence, this material is vigorously processed to make it physically soft, edible, and assimilable. The media which are used for *Shodhana* process must play the role for the removal of the impurities from the raw drug and make it more feasible for the further pharmaceutical procedure, that is, *Marana* (the process of making *Bhasma*). Classical texts described the untoward effects of *Vajra;* if it is not purified properly which will cause integumentary disease (*Kushtha*), pallor (*Pandu*), lameness-bilateral (*Pangu*), etc.[62] The media used in the process of 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.[63] In such cases, the ultimate object of the processing is to produce a suitable product for the human body, without producing harm in therapeutically effective doses.

Results

On reviewed; from classical texts, the researcher was found *Shodhana* procedures in Rasa texts except for Nighantu and Samhita. More than 30 classical texts of Rasa Shastra have been explained in depth about *Vajra Shodhana*. The acceptable features (classical *Grahya Lakshana*), types and symptoms from consumption of unpurified diamond (*Ashodhita* or *Apakwa Sevana Janya Vikara*) were stated in Nighantu and other Rasa texts. *Shodhana* procedures of *Vajra* revealed multiple methods that are categorized according to its principle and media used in the procedures. Thirty-four methods of *Vajra Shodhana* are found in Rasa classics that can be segregated into five basic principles, that is, Swedana in Dolayantra (giving heat by suspension of the drug in liquid), *Nisechana* (immersion *of* heated solid in liquid), *Puta* (the measure of heat*)-Nisechana*, *Swedana-Puta- Nisechana*, and *Swedana-Nisechana*. Swedana and Nisechana are the single process which used for Shodhana. Other methods are continuous process. The other three methods are the continuous process used for *Shodhana* of the *Vajra*. Detailed methods are described as below.

Swedana

Swarasa (juice) used as Shodhana media

- Common *Shodhana* method for *Ratna*: Any gem or *Ratna* is purified if it is boiled in a *Dolayantra* for 1 h with the juice of *Jayanti* leaves[64]
- *Tanduliya* (*Meghanada*) juice (*Swarasa*) is used for *Shodhana* of *Ratna Shodhana* by *Swedana* method.[65]

Kwatha preparation in water (as a liquid media)

- Direct heating with *Kwatha* of the single drug: Diamond is purified, if it is boiled for 1 *Prahara* or 1 *Yama* (3 h), by means of a *Dolayantram*, with the decoction of *Kullattha* or *Kodarva*[12]
- Indirect heating with *Kwatha* of the single drug: Diamond is purified, if it is put inside the tuber of *Vyaghrikanda* and boiled for 7 days, by means of a *Dolayantra* with the decoction of *Kodrava* and *Kullattha*[49]
- Indirect heating with *Kwatha* of multiple drugs: Diamond is purified, if it is kept inside a lime fruit and boiled for 3 days by means of a *Dolayantra* with a decoction of *Meghanada*, *Shami*, *Shyama*, *Shringi*, *Madana*, *Kodrava*, *Kullattha*, *Vetasa*, *Agatsya* (*Vasaka*), and *Nirgundi* mixed with a sufficient quantity of water.[66]

Kwatha preparation in Haya Mutra (as a liquid media)

- Indirect heating with multiple drugs: Diamond is purified, if it is kept in *Jambveera* or *Suranakanda* and boiled for 1 or 3 days

in *Kwatha* prepared by *Meghanada*, *Shami*, *Shyama*, *Shrungi*, *Madan*, *Kodrava*, *Kulattha*, *Vetasa*, *Agtsaya*, *Sinduvara*, and *Aakhuparni* in *Haya Mutra*.[67-69]

Kwatha preparation in water, Hayamutra, and Snuhi Ksheera (as a liquid media)

- Indirect heating with multiple drugs: Purification of the diamond is done in *Kwatha* prepared with *Kullattha* and *Kodrva* with the liquid media of *Haya Mutra*, water, and *Snuhi Ksheera*. Diamond is kept in *Vyaghrikanda* in this procedure and boiling is done.[70]

Nisechana (Vapitam, Nirvapitam)

Ashuddha Vajra is heated red-hot over the intense fire and dipped in enough quantity of "*Snuhi Ksheera*"[71] or "*Shuddha Parada*."[11,72,73] This process of heating and dipping is repeated for 100 times to obtain the *Vajra* purified. Later, the drug is collected, washed, dried, and stored in a suitable airtight container as "*Shuddha Vajra*" for further pharmaceutical use. This same procedure is done in another liquid media, that is, 25 quenching in *Medhaka Mutra* (frog urine)[11] or 108 quenching in *Gulab Jala* (rose water)[11] or 200 quenching in *Haya Mutra* (horse urine).

***Puta* followed by the *Nisechana* method**

- Diamond of excellent quality is to be put inside the tuber of *Vyaghrikanda*. This is to be covered on all sides with the stool of a she-buffalo, and burnt by means of fire made of cow dung cakes burning the *Ahoratri* (whole night), at the close of which the diamond is to be immersed into horse's urine. This process is to be performed seven nights resulting in the purification of the diamond[74,75]
- Diamond is purified, if it is kept inside the tuber of a *Vyaghri* plant coated on all sides with mud, heated by *Puta* for 24 h, and then immersed into horse's urine or *Snuhi Ksheera*.[76-79]

***Swedana* followed by the *Nisechana* method**

Small pieces of diamond are placed in a cavity made in the tuber of *Vyaghrikanda* or *Varahikanda*. It is then wrapped in the leaves of *Kadali* and then bundled in a muslin cloth in accordance with the standard procedure. The bundle is then subjected to digestion in *Dolayantra* in the media of *Kwatha* of *Kullattha* and *Kodrava* for 3 days. The digestion of *Vajra* in *Dolayantra* is carried out day and night. The digested *Vajra* is then taken out and is subjected to further processing. The diamond pieces are then placed in a container and the container is heated. The hot pieces of diamond are then quenched in *Khara Mutra* (urine of donkey). The process of heating and quenching is employed repeated 21 times to produce purified *Vajra*.[80]

***Swedana-Puta-Nisechana* method**

- Diamond is digested in *Kullattha* or *Kodrava Kwatha* in *Dolayantra*. Then that diamond is kept in a cavity made in the tuber of *Vyaghrikanda* and wrapped with mud. Then, it is subjected to *Puta* for *Ahoratri*. That diamond is further processed by the *Nisechana* procedure in horse urine or *Snuhi Ksheera*[49]
- Diamond is boiled for *Diwaratri* (24 h) in *Kullattha Kodrava Kwatha, Haya Mutra,* and *Sunhi Ksheera*. Then, it was subjected to *Gaja Puta* and *Nisechsna* is done in the same media used for boiling[81]
- Diamond is kept in the core of *Vyaghrikanda* and boiled in *Kwatha* prepared with *Kullattha*, *Kodrava*, *Hayamutra,* and *Snuhi Ksheera* for *Ahoratri*. Then, it was again covered with *Vyaghrikanda* and subjected to *Puta.* The diamond is further processed by the *Nisechana* procedure in *Kanchana drava*.[82]

Details of *Rasapanchaka* of all *Shodhana Dravya* which is used for *Vajra Shodhana* are tabulated in Table 1. Chemical constituents with their respective bioactivity of Shodhana Dravya are introduced in Table 2.

Discussion

Maximum *Swedana* principle used for *Vajra Shodhana*, that is, 27 times (53%) [Chart 1]. The maximum duration of heating for *Swedana* is found as 7 days and a minimum for 1 Yama (~1 *Prahara*, 3 h). *Veshtana Dravya* (covering material) used in *Swedana* process are Vyaghrikanda (*Kantakari Kalka: Solanum virginianum* L.), *Jambvira* (*Citrus* X *jambhiri* Lush.), and *Vajrakanda* (*Suranakanda*: *Amorphophallus paeoniifolius* (Dennst.) Nicolson). The chemical

Table 1: *Rasapanchaka* of *Shodhana Dravya*

Drug name	*Rasa*	*Guna*	*Veerya*	*Vipaka*
Tanduliyaka[83]	*Madhura, Kashaya*	*Laghu, Ruksha*	*Shitala*	*Madhura*
Kulattha[84]	*Kashaya*	*Laghu, Vidahi*	*Ushna*	*Katu*
Kodrava	----	----	----	----
Shyama[85]	*Madhura*	*Ruksha*	*Ushna*	----
Shami[86]	*Tikta, Katu, Kashaya*	*Sheet, Laghu*	----	----
Nagarmotha[87]	*Katu, Tikta, Kashaya*	*Laghu, Ruksha*	*Sheeta*	*Katu*
Varshabhu[88]	*Tikta*	*Shitala*	*Ushna*	*Katu*
Akhukarni[89]	*Katu, Tikta, Kashaya*	*Shita, Laghu*	*Ushna*	*Katu*
Munitaru[90]	*Tikta*	*Shita, Ruksha*	*Sheeta*	*Katu*
Amlavetas[91]	*Atyamla*	*Laghu, Ruksha*	*Ushna*	*Amla*
Meshashrungi[92]	*Tikta*	*Ruksha*	-	*Katu*
Suranakanda[93]	*Kashaya, Katu*	*Ruksha, Vishada, Vishtambhi, Laghu*	*Ushna*	*Katu*
Madanphala[94]	*Madhura, Tikta*	*Laghu, Lekhana, Ruksha*	*Ushna*	*Katu*
Sindhuvaraka[95]	*Kashaya, Katu, Tikta*	*Laghu*	*Ushna*	*Katu*
Priyangu[96]	*Madhura, Kashaya*	*Ruksha, Guru*	*Sheeta*	*Katu*
Gulab[97]	*Tikta, Katu*	*Laghu*	*Sheeta*	*Madhura*
Snuhi Ksheera[98]	*Katu*	*Snigdha, Laghu*	*Ushna*	*Katu*
Haya Mutra[99]	*Tikta, Katu*	*Tikshana*	*Ushna*	----

Table 2: Elucidation of chemical constituents with their bioactivity of *Shodhana dravya* for *Vajra Shodhana*

Drug name	Chemical constituents	Bioactivity
Tanduliyaka	Rutin, Quercetin (Flavonoids)[100] squalene, trilinolein, polyprenol, and phytol from the leaves; spinasterol and squalene from the stems; and spinasterol from the roots[101]	Antinociceptive, antipyretic, antioxidant, antimicrobial, hepatoprotective activity, anti-inflammatory, antihelmintic activity, antifungal activity, antihyperglycemic and hypolipidemic activity[102]
Kulattha[103]	streptogenin, β-sitosterol, bulbiformin, linoleic acid, polyphenols, oxalates, and crude fiber	diuretic activity, analgesic activity, anti-inflammatory activity
Kodrava	Tannins and phenolic compounds, carbohydrate, saponins, protein and amino acid[104]	Antibacterial, antitoxic, anti-inflammatory, antioxidant[105]
Shyama[106]	bioactive compounds such as α- and β-turpethein, turpethinic acids (A, B, C, D, and E), coumarins, cycloartenol, lanosta-5-ene, 24-methylene-δ-5-lanosterol, α- and β-rhamnose, β-sitosterol, lupeol, scopoletin, betulin, acrylamide, stigma-5,22dien-3-O-β-D-glucopyranoside, β-sitosterol-β-D-glucoside (H-1), 22,23-dihydro-α-spinosterol-β-D-glucoside (H-2), and salicylic acid (CH-2)	Antihepatotoxic activity, antinephrotoxic activity, antiulcer activity, antidiarrheal activity, cytotoxic activity, analgesic activity, anti-arthritic activity, anti-inflammatory activity
Shami	Tannins (gallic acid), steroids (stigmasterol, campesterol, sitosterol, etc.), flavone derivatives (prosogerin A, B, C, D, and E), alkaloids (SPICIGERINE, PROSOPHYLLINE)[107]	Antibacterial activity, antihyperglycemic activity, antidepressant effect, skeletal muscle relaxant, bronchodilator activity, vasodilatory activity, detoxifying activity, anticancer activity, analgesic activity, anticonvulsant activity, antioxidant activity[108]
Nagarmotha[109]	Alkaloids, flavonoids, tannins, starch, glycosides, furochromones, monoterpenes, sesquiterpenes, sitosterol, a fatty oil containing a neutral waxy substance, glycerol, linolenic, myristic, and stearic acid	Anti-inflammatory, antipyretic, analgesic and sedative, antiarthritic, smooth muscle relaxant
Varshabhu	Ecdysterone and the other constituents are trianthenol, 3-acetylaleuritolic acid, 5,2′-dihydroxy-7-methoxy-6,8-dimethy lflavone, leptorumol, 3,4-dimethoxy cinnamic acid, 5-hydroxy-2-methoxybenzaldehyde, p-methoxybenzoic acid, and beta-cyanin[110]	Anti-inflammatory activity, antibacterial activity, antipyretic activity, anti-oxidant activity, hypolipidemic activity, analgesic activity, anti-ulcer activity[111]
Akhukarni[112]	Resins, glycosides, reducing sugars, amino acids, tannins and fixed oils have been reported to be present in various extracts of the plant. Seeds of the plant have shown to be rich in caffeic, p-coumaric, ferulic and sinapic acids esters	Antioxidant, α-amylase inhibitory , nephroprotective, anti-inflammatory and anticancer, blood pressure lowering, and cardiovascular protective
Munitaru[113]	Alkaloids, flavonoids, saponins, tannin, triterpenoids, glycosides, and phenols	Antibiotic, anthelmintic, antitumor, and contraceptive
Amlavetas[114]	Emodin, aloe-emodin, physcion, chrysophanol, rhein, emodin glycoside, chrysophanol glycoside, 8-O-B-D-glucoside, revandchinone-1,revandchinone-2, revandchinone-3, revandchinone-4, 6-methyl-rhein and 6-methyl aloe-emodin	Antifungal, anti-microbial, anti-Parkinson's, anti-proliferative, immune enhancing, antiviral, antioxidant
Meshashrungi	Alkaloids, Saponin, terpenoid, tannin, steroids, cardiac glycoside, flavonoid[115] chrysin, chrysin-7-rutinod=side, chrysin-7-glucoside, octacosanol, dehysro-alpha-lapachone, lapachol, Beta sitosterol, sitosterol, dehydrotectol, tectol, paulownin, Dehydro alpha lapachone, beta lapachone, papachol, dehydrotectol, tectoquinone, and beta-sitosterol[116]	____
Suranakanda	Beta-sitosterol, campesterol, hexadecanoic acid, oleic acid, phenol, hexadecanoic acid, tetradecanoic acid, Vitamin E, 1,3,5 benzenetriol[117]	Cytotoxic, hepatoprotective, antioxidant, antibacterial, and antifungal activities[118]
Madanphala[119]	Glycosides, randioside A, mollisidial triterpenoid glycosides and randianin, six saponins dumetoronins A to F. A hemolytic triterpenoid saponins that is Randianin, from fruit of *R. dumetorum*	Antibacterial activity, anti-allergic activity, anti-inflammatory activity, analgesic activity, immunomodulatory activity

(Contd...)

Table 2: *(Continued)*

Drug name	Chemical constituents	Bioactivity
Sindhuvaraka[120]	6′-p-hydroxybenzoyl mussaenosidic acid; 2′-p-hydroxybenzoyl mussaenosidic acid viridiflorol; β-caryophyllene; sabinene; 4-terpineol; gamma-terpinene; caryophyllene oxide; 1-oceten-3-ol; globulol; 5,3′-dihydroxy-7,8,4′- trimethoxyflavanone; 5,3′-dihydroxy,6,7,4′trimethoxyflavanone; 5-hydroxy-3,6,7,3′,4′-pentamethoxy flavones; 5,7dihydroxy-6,4′ dimethoxy flavonone; 5hydroxy-7,4′ dimethoxy flavones; 5,3′-dihydroxy-7,8,4′-trimethoxy flavanone; betulinic acid [3β-hydroxylup-20-(29)-en-28-oic acid]; ursolic acid [2β -hydroxyurs-12-en-28-oic acid]; n-hentriacontanol; β-sitosterol; p-hydroxybenzoic acid; protocatechuic acid; oleanolic acid; flavonoids angusid; casticin; vitamin-C; nishindine; gluco-nonitol	Anti-inflammatory activity, antinociceptive activity, CNS depressant activity, antifungal activity, antioxidant activity, enzyme-inhibitory activity, anticonvulsant activity, antibacterial studies, antiallergic activity, histomorphological and cytotoxic effects, hepatoprotective activity, immunomodulatory activity
Priyangu[121]	Calliterpenone, calliterpenone-17-acetate, oleanolic acid	Antibacterial, antidiabetic activity, analgesic and antipyretic activity, anti-arthritic activity
Gulab	Phenyl ethanol (43%), Geranyl acetate (15.6%), Geraniol (10.5%), Linalool (6.9%), Benzyl alcohol (3.3%), Benzaldehyde (1.5%), Nerol (5-10%), Citronellyl acetate (0.3%), tannins, oloigomeric proantrocyanides, saccharine matter, mineral salts, salt of mallic acid and tartaric acid, Pectin (11%), Riboflavin, sugars, purgative glycosides[122]	-------
Snuhi Ksheera	Euphol[123]	Hepatoprotective activity, anti-inflammatory analgesic activity, antioxidant activity, immunomodulatory activity, radioprotective, diuretic activity, antidiarrheal activity, antibacterial activity[124]
Haya Mutra	40 anabolic steroids and corticosteroids, and over 50 acidic drugs, including some cyclooxygenase-2 (COX-2) inhibitors, oxicams, anti-diabetics, sedatives, diuretics and Δ^9-tetrahydro-11-norcannabinol-9-carboxylic acid[125]	-------
Medhaka Mutra	Urea, ammonia, uric acid[126]	-------

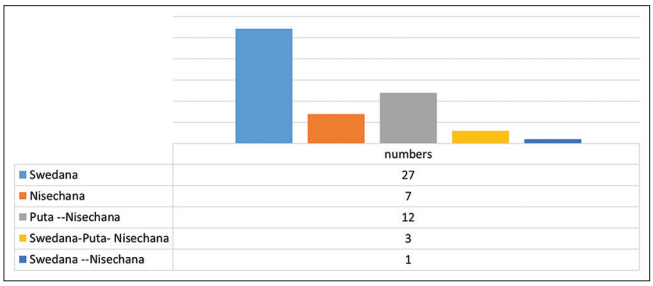

Chart 1: Numbers of procedures employed for *Vajra Shodhana* in classics

composition of covering material may also interact with diamond and makes it brittle or feasible form for further pharmaceutical processes. *Kullattha, Kodrava, and Tanduleeya* are the single drugs that are used for the Shodhana process in the Swedana principle. Among them, *Kodrava Kwatha* (16 times) was noted highest followed by *Kullattha Kwatha* (13 times) as a single media used for *Shodhana*.

For *Nisechana* process; animal origin (frog and horse urine), herbal origin (milk of *Snuhi*, distillate of rose petals), and mineral origin (mercury) media have been stated in classics. Maximum *Nisechana* frequency is found, that is, 200 times in horse urine and minimum in frog urine as 25 times. Frog urine may be considered as the sturdiest media for quenching process because only 25 quenching have been stated in this media. One hundred quenching in *Snuhi Ksheera* may be found difficult practically because of the draggy process of *Snuhi Ksheera* collection. One published pharmaceutical research on this process was taken *Gulab Arka* in place of *Gulab Jala*.[127] Method of preparation for *Gulab Jala* is mentioned in Aryabhishaka.[128] *Gulab Arka* process is described in Arka Prakasha.[129] In the *Ayurvedic* pharmacopeia of India, the method of preparation for *Gulab Arka* included the addition of 12.5 times of water and distillate *Arka* up to 80%.[130] If we are distillate *Arka* by different concentrations, then pH of *Gulab Arka* will be changed.[131] Hence, there is a question arises regarding *Gulab Jala* and *Arka*. Therefore, one can take *Gulab Arka* as per selection criteria and standardization point of view. Only *Parada* (mercury) media belong to Schedule-E1 (poisonous drug list),[132] which is not cost effective. Hence, all media do not use easily in routine pharmaceutical practices as per the feasibility of the researcher and unavailability of media. There is no use of *Kwatha* (decoction) dosage form in *Nisechana* method of *Shodhana*. Horse and donkey urine are mentioned in *Swedana* and *Nishechana* principle in *Shodhana*. Horse urine is used as *Kwatha* preparation of herbal drugs.

However, a lower frequency of *Nisechana* (7 times) is found in *Puta* followed by *Nisechana* principle of *Shodhana* process. From *Puta* procedure, material may become a more suitable form

Table 3: Drugs used in process of *Shodhana*

Plant origin	*Swarasa* (1)	*Tanduleeya Jala* (*Amaranthus viridis* Linn.)
	Kwatha (15)	*Kulatha (Dolichos biflorus* Linn), *Kodrava (Paspalum scorbiculatum* Linn.), *Shyama (Nisotha) (Operculina turpethum* Silva Manso*), Shami (Prosopis cineraria* Linn.), *Ghanarava (Nagarmotha) (Cyprus rotundus* Linn.), *Varshabhu (Trianthema portulacastrum* Linn.), *Akhukarni (Ipomoea reniformis* Chois),*Munitaru (Agatsya)(Sesbania grandiflora* Linn.), *Amlavetasa (Rheum emodi* Wall.), *Meshashrungi(Dolichandrone falcata* Seem.), *Suranakanda (Amorphophallus campanulatus* Blume.), *Meghanada, Madanphala (Randia dumentorum* Lam.), *Sindhuvaraka (Nirgundi) (Vitex negundo* Linn.), *Priyangu (Callicarpa Macrophylla* Vahl.)
	Arka (1)	*Gulab (Rosa centifolia* Linn.)
	Ksheera (1)	*Snuhi (Euphorbia nerifolia* Linn.)
Animal origin	*Mutra* (2)	*Haya Mutra* (Horse urine), *Medhaka Mutra* (Frog urine), *Khara mutra* (urine of donkey)
	Mineral (1)	*Parada* (Mercury)

for further process. Hence, *Puta* followed by *Nisechana* principle described a lower frequency rate than only *Nisechana* principle. Heating duration in *Puta* principle is also mentioned in classics. Frequency of process and heating duration may be the most important key role in *Shodhana* process to convert the material in a suitable form. In *Shodhana* by *Puta* and *Nisechana* method, maximum heating duration is found as *Ahoratra* (time equivalent to a day and night). *Gaja Puta* (a type of heating arrangement) is the only *Puta* type mentioned for *Shodhana* of *Ashuddha Vajra* in different classics. The maximum temperature is stated for *Gaja Puta*, that is, 1000°C for 1 h.[133] Hardness of diamond is 10. Accordingly, it may be one of the reasons for *Puta* principle during *Shodhana* process of *Vajra*.

In *Swedana-Puta-Nisechana* method of *Shodhana*, frequency is described in *Swedana* method but not described in *Puta* and *Nisechana* method of *Shodhana* in classics. Continuous process, that is, *Swedana*, *Puta*, and *Nisechana* is mentioned in current classical texts (after 18th century), that is, Brihad Rasa Raj Sundara, Rasa Ratna Samuchaya, and Rasa Ratnakara Vruddhi Khanda.

Kwatha dosage form is majorly found in process of *Vajra Shodhana*. In animal origin, horse, frog, and donkey urine are described (Table 3). On review, *Katu* (bitter)-*Tikta (*pungent)-*Kashaya* (astringent) taste (*Rasa*), *Laghu* (light)-*Ruksha* (dry) in properties, *Ushna* (hot) *Veerya* (potency), and *Katu* (bitter) *Vipaka* (bio-transferred) were found from classics on *Rasapanchaka* of *Shodhana Dravya*. Classical texts described the untoward effects of *Vajra* if it is not purified properly which are pallor (*Pandu*), hemiplegia (*Pangu*), pain in flanks (*Parshva Vedana*), and increasing body temperature (*Tapa*) and giddiness (*Bhrama*). The drugs which are used for the *Shodhana* of *Vajra* having maximum hepatoprotective activity, anti-inflammatory activity, cytotoxic activity, antidepressant effect, anti-cancer, anti-tumor, anticonvulsant activity, and immunomodulatory activity (Table 3). Therefore, the above activities of *Shodhana Dravya* may reduce the untoward effects of raw diamond. Hence, one can use these *Shodhana Dravya* as an antidote for eliminate the untoward effect of *Vajra*.

Conclusion

The concept of *Shodhana* (purifying process) in Rasashastra is not merely a process of purification/detoxification but also a process resorted to enhance the potency and efficacy of the drug. Duration of heating and drug used for *Shodhana* and method of *Shodhana* is playing a key role in the *Shodhana* process. The selection of *Shodhana Dravya* mainly depends on desirable efficacy and availability too. Each *Shodhana Dravya* has its properties to remove impurities from raw material. *Shodhana* possesses reduction of particle size of raw material and addition of organic contents from *Shodhana* media to raw material. *Swedana* principle is the maximum used for the Shodhana process of Vajra. The author anticipates this compiled data will be helpful for Ayurveda research scholars and health professionals too.

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