

Review



Critical review on *Druti Kalpana* (liquification technics) of *Rasadravyas* explained in different texts of *Rasashastra*

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ABSTRACT:

Background: *Rasashastra* is a branch of science which deals with the study of Minerals and Metals along with their formulations, among these formulations the *Acharyas* has mentioned various dosage forms. Among them *Druti Kalpana* occupies one of the important dosage form. The *Rasashastra* and *Bhaishajya Kalpana* texts describe a variety of dosage forms, including *Churna* (powder drug), *Guti* (Pills), *Vati* (Tablet), *Kwatha* (Decoction), *Bhasma* (Incinerated Ash), *Pottali* (Medicinal pouch), *Sindhura* (Mercuric sulphide/oxide) and others. *Druti* is one of the important yet ignored dosage forms of *Ayurveda* pharmaceuticals listed in the *Rasashastra* texts. **Aims:** This article focuses to understand *Druti Kalpana* better by going through classical *Ayurvedic* texts, Research papers, and other related sources. **Methods and Material:** *Druti* is referenced in several classical texts such as *Rasaratna Samuchhaya*, *Rasa Prakasha Sudhakara*, *Ayurveda Prakasha*, and *Rasa Marthanda*, yet a comprehensive procedure for all types of *Druti* is not clearly detailed. Similarly, *Ratnadruiti* lacks thorough explanation in these traditional works. **Result:** The compilation results into the proper understanding of the procedures to prepare *Druti Kalpanas* by adopting fundamental principles of *Rasashastra* and remains an important medicinal technique. **Conclusion:** The review shows that *Druti Kalpana* is an important but less commonly studied dosage form in *Rasashastra*. Although it is mentioned in many classical *Ayurvedic* texts, there are no clear and standardized methods available for its preparation. Among these, *Ratnadruiti* is especially not well explained, which makes it difficult to use in practice.

KEYWORDS: Ancient alchemy, nanosuspension, molten state, liquification

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1. INTRODUCTION

The word “*Druti*” is derived from the root word “*DruKitan*” means *Drutatva* (liquification) [1] or becoming liquid. In *Rasashastra*, *Druti* is one such important pharmaceutical process of *Rasashastra*, wherein the metals / minerals / gemstones are transformed into a permanent and stable liquid form. [2] Normally, when metals or minerals are heated to a certain temperature, they melt, but once the heat is removed, they solidify again. This means their liquid state is temperature dependent. *Druti*, however, is not just melting; it involves keeping the material in a molten state permanently, while retaining the desired properties. The details and characteristics of this process are described in classical *Rasashastra* texts such as *Rasa Hrudaya Tantra* (10th century AD), *Rasarnava* (10th-12th century AD), *Rasendra Chudamani* (12th-13th century AD), *Rasaratna Samuchhaya* (13th century AD), *Rasaprakash Sudhakara* (13th century AD), and *Ayurved Prakash* (16th century AD) etc.

Definition of *Druti Kalpana*:

According to *Rasaratna Samucchaya*, when any metal or mineral is exposed to tremendous heat along with a few selected *Aushadha Dravya* (Medicinal drugs), the molten metal tends to remain liquid exclusively. *Druti* refers to the metal or mineral's permanent liquid state.

Druti Lakshana:

Five characteristics of *Druti* are as follows:

Nirlepatvam: Nonstick; should not adhere to the container.

Drutatvam: Liquid state; should be evenly molten.

Tejastvam: lustrous.

Laghuta is lighter than its initial weight.

Samyogaschasootena: Easily combines with mercury. [3]

Types of *Druti*:

According to their uses:

- i. *Lohasiddhikruta* (In mercurial processes)
- ii. *Dehasisshikruta* (In treatment of diseases)

According to the material:

- i. *Dhatu Druti* (all metals)
- ii. *Ratna Druti* (all precious stones)
- iii. *Gandhak Druti, Abhrak Druti*. [4]

According to the *Varga*:

- i. *Maharasa Varga: Abhraka Druti, Vaikranta Druti, Svarnamakshika Satwa Druti* etc
- ii. *Uparasa Varga: Gandhaka Druti, Haratala Druti* etc
- iii. *Dhatu Varga: Svarna Druti, Rajata Druti, Loha Druti* etc
- iv. *Ratna Varga: Mukta Druti, Vajra Druti* etc. [5]

Based on usage in *Parada Samskar*:

- i. *Garbha Druti* (Internal Liquification): The method of mercurial process in which material given as a *Grasa* is liquified within mercury.
- ii. *Bahya Druti* (External Liquification): In this method *Abhrakadi satva* are melted outside before adding with mercury for *Jarana* (Digestion or Assimilation of Metals and Minerals by Mercury).

According to their Utility:

- i. Used for mercurial processes, for example, *Abhrak Druti, Swarna Druti, Ratna Druti* etc.
- ii. Used for treating diseases, for example, *Tamra Druti, Druti Sara Rasa* etc.

iii. Used for both Purposes, for example, *Gandhaka Druti*. [6]

Different methods for *Druti* preparation:

- i. *Swedana method* (Steaming process): In this method, *Ratnas* are kept in bolus made by paste of drugs and covered with leaf of *Betula utilis* and suspended in *Dolayantra* and *Swedana* is done for 3 nights on high flame.
- ii. *Avapa method* (Quenching): for example, *Svarna, Roupya Druti, Teekshna Loha Druti*, etc.
- iii. *Putra method* (Incineration): for example, *Mukta Druti*.
- iv. *Sthapana method* (Keeping inside a pit): for example, *Abhraka Druti*.

2. MATERIALS AND METHODS

This article follows a qualitative literary review approach. Primary data has been collected from:

Classical Ayurvedic texts such as *Rasaratna Samuchchaya, Rasa Prakasha Sudhakara, Ayurveda Prakasha, Rasa Marthanda*, and others.

Modern research articles, dissertations, and relevant publications from Ayurvedic journals and databases.

Secondary sources were done using electronic database search engine like pubmed and Google Scholar.

Table No.1- Description of *Dhatu Drutis*:

Name	Reference	Ingredients	Method
<i>Swarna Druti</i> - 1 st method	<i>Rasaratna Samuchchaya</i>	<i>Swarna</i> (Gold), <i>Indragopa Churna</i> (Red velvet insect), <i>Devadali phala Swarasa</i> (<i>Luffa echinata Roxb</i>)	<i>Bhavana</i> of <i>Indragopa churna</i> in <i>Devadali phala Swarasa</i> . <i>Dravikarana</i> of <i>Swarna</i> in <i>musha</i> , Add <i>Bhavita</i> (Lavigated) <i>Indragopa churna</i> in <i>Dravita Swarna</i> (Liquified gold). [8]
<i>Swarna Druti</i> - 2 nd method	<i>Brihat Rasarajasundar</i>	<i>Swarna</i> (Gold), <i>Manduka Asthi</i> (Frog Skeleton), <i>Manduka Vasa</i> (Frogs Muscle fat), Purified <i>Tankan</i>	Take equal parts of Ingredients except <i>Swarna</i> . Make <i>Churna</i> of <i>Manduka Asthi</i> (Frog Skeleton), <i>Suddha Tankan</i> (Purified Borax) and <i>Indragopa</i> . Mix <i>Manduka Vasa</i>

The search terms *Druti Kalpana* AND Nano suspension, *Druti kalpana* OR Nano suspension & *Druti Kalpana* NOT Nano suspension as follows:

Pubmed:

("Druti"[All Fields] AND "kalpana"[All Fields]) NOT ("nano"[Journal] OR "nano"[All Fields]) AND ("suspension s"[All Fields] OR "suspensions"[Supplementary Concept] OR "suspensions"[All Fields] OR "suspension"[All Fields] OR "suspensions"[All Fields])

Google Scholar:

"*Druti kalpana*" AND Nano suspension
 "*Druti kalpana*" OR Nano suspension
 "*Druti kalpana*" NOT Nano suspension

General method of preparation of *Dhatudruti*:

Mix all the eight forms of *Dhatu bhasmas* with *Vajra bhasma* and triturate it with the dravyas (ingredients) described in the second method of *Vaikranta druti* to make a fine paste. A ball of this paste is formed and placed in the center, covered in *Bhoorja patra*. This is then wrapped in cloth and tied with thread. This pottali is later subjected to *Swedana* in *Dolayantra* using *Amla Tushodaka* for seven days. [7]

		(Borax), <i>Haya lala</i> (Horse Siliva) and <i>Indragopa</i> (Red velvet Insect).	+ <i>Haya lala</i> in separate container, Add <i>Churna</i> (Powder) in it. Then make <i>Dravikarana</i> of <i>Swarna</i> . Later mix <i>Dravita Swarna</i> (Liquified Gold) in that mixture. [9]
<i>Rajata Druti-1st method</i>	<i>Rasaratna Samuchchaya</i>	<i>Rajata</i> (Silver), <i>Devadali Churna</i> (<i>Luffa echinata Roxb</i>), <i>Nara Mootra</i> (Human Urine)	<i>Bhavana</i> (lavigation) of <i>Devadali Churna</i> with <i>Nara Mootra</i> -7 times and make it dry (<i>Avapa</i>), <i>Dravikarana</i> of <i>Rajata</i> in <i>Musha</i> . Mix <i>Dravita Rajat</i> and <i>Bhavita Churna</i> . [10]
<i>Rajata Druti-2nd method</i>	<i>Brihat Rasarajasundar</i>	<i>Rajata</i> (Silver), <i>Devadali Churna</i> (<i>Luffa echinata Roxb</i>), <i>Nara Mootra</i> (Human Urine)	<i>Bhavana</i> (Levigation) of <i>Devadali churna</i> with <i>Nara mootra</i> -100 times and make it dry (<i>Avapa</i>) of <i>Rajata</i> in <i>Musha</i> (Crucible). Mix <i>Dravita Rajata</i> and <i>Bhavita Churna</i> (Lavigated powder). [11]
<i>Tamra Druti</i>	<i>Rasendra Chintamani</i>	<i>Tamra</i> (Copper), <i>Haratala</i> (Arsenic trisulphide), <i>Manashila</i> (Arsenic disulphide), <i>Gandhak</i> (Sulphur) and <i>Hingula</i> (Murcuric Sulphide) - All Equal quantity.	Take all ingredients in <i>Kacha-Kupi</i> (Glass Bottle), Keep in <i>Valuka Yantra</i> (heating apparatus filled with soil) for 48 hours. Give <i>Teevra agni</i> (Intence heat). [12]
<i>Teekshna Loha Druti-1st method</i>	<i>Rasaratna Samucchaya</i>	<i>Teekshna loha</i> , <i>Jalini Katukoshataki</i> (<i>Luffa acutangula Roxb</i>) <i>Panchang</i> , <i>Gomutra</i> (Cow's Urine)	First make <i>Bhasma</i> of <i>Jalini Katukoshataki panchang</i> . Give <i>Bhavana</i> with <i>Gomutra</i> -21 times. Make powder of <i>Bhavita Bhasma</i> , <i>Dravikarana</i> of <i>Teekshna loha</i> and mix with the powder. [13]
<i>Teekshna Loha Druti-2nd method</i>	<i>Rasaratna Samucchaya</i>	<i>Tamra</i> (Copper) <i>Devadali panchang</i> (<i>Luffa echinata Roxb</i>), <i>Gomutra</i> (Cows urine)	First make <i>bhasma</i> of <i>Devadali panchang</i> (<i>Luffa echinata Roxb</i>). Give <i>Bhavana</i> with <i>Gomutra</i> -21 times. Make powder of <i>Bhavita Bhasma</i> . <i>Dravikarana</i> of <i>Teekshna loha</i> and mix with the powder. [14]
<i>Kanta Loha Druti</i>	<i>Rasaratna Samucchaya</i>	<i>Tamra</i> (Copper) <i>Devadali panchang</i> (<i>Luffa echinata Roxb</i>), <i>Nara mutra</i> (Human Urine)	First make <i>bhasma</i> of <i>Devadali panchang</i> (<i>Luffa echinata Roxb</i>). Give <i>Bhavana</i> with <i>Nara mutra</i> -21 times. Make powder of <i>Bhavita Bhasma</i> . <i>Dravikarana</i> of <i>Teekshna loha</i> and mix with the powder. [15]
<i>Loha Druti</i>	<i>Rasaratna Samucchaya</i>	<i>Loha</i> (Iron), <i>Purified Gandhak</i> , <i>Devadali swaras</i> (<i>Luffa echinata Roxb</i>)	<i>Mardana Gandhak</i> with <i>Devadali</i> (<i>Luffa echinata Roxb</i>) <i>Swaras</i> for 7 days and make it powder, Later <i>Dhamana</i> (heating to red hot) of <i>Loha</i> in <i>Musha</i> (crucible). Add <i>Bhavita churna</i> with <i>Dravita loha</i> . [16]
<i>Loha-Ashta Druti</i> (Common method for	<i>Rasaratna Samucchaya</i>	<i>Swarna</i> (Gold), <i>Rajata</i> (Silver), <i>Tamra</i> (Copper), <i>Loha</i> (Iron), <i>Naga</i> (Lead), <i>Vanga</i> (Tin), <i>Kansya</i> (Bronze), <i>Pittala</i> (Brass), <i>Purified</i>	Mix (<i>Purified Gandhak Churna</i> + <i>Purified Kanta Pashana Churna</i>) Take anyone respective <i>Loha</i> (<i>Swarna</i> , <i>Rajata</i> , <i>Tamra</i> , <i>Loha</i> , <i>Naga</i> , <i>Vanga</i> , <i>Kansya</i> , <i>Pittala</i>) in <i>Musha</i> and do <i>Dhamana</i> to make it <i>Dravita</i> (liquid) form. Add mixed

eight Lohas)		<i>Gandhak Churna</i> , Purified <i>Kanta Pashana</i> (Iron oxide) <i>Churna</i>	<i>churna</i> with <i>Dravita loha</i> . [17]
<i>Pittala Druti</i>	<i>Rasaratna Samucchaya</i>	<i>Pittala</i> , Gram flour Or Wheat flour	Mix the powder of <i>Pittala</i> of high quality with any edible substance like gram flour or wheat flour and feed it to a black coloured, strong and young goat. Then collect its feces and burn it in an earthen pot and reduce it to ashes. By doing this only, <i>Pittala</i> will become soft. This softness will be like 14 carat gold of slightly less colour than 16 carat gold. It can be used in <i>Lohasiddhi</i> and <i>Dehasiddhi</i> . [18]

Method of Preparation of *Ratna Druti*:

They fine paste is made using with the equal quantity of ingredients like *Hingu* (*Ferula foetida*), *Saindhava lavana* (Rock salt), *Samudra lavana* (Sea salt), *Souvarchala lavana* (Black salt), *Vida lavana* (Fetid salt), *Audbhida lavana* (Sodium carbonate), *Sarjikshaara* (Saltpetre), *Yavakshaara* (Alkali of Barley), *Tankanakshaar* (Borax), *Mamsarasa* (Broth), *Amlavetas*, *Navasadora*, Ripened *Jayaphala* seeds (*Myristica fragrans*), *Kalihaari* (*Andrographis paniculata*), *Vanshalochana* (*Bambusa arundinacea*), *Chitraka Mula* (Root of *Plumbago zeylanica*), *Rudanti* (*Tecoma undulata*), *Jambuki*

(*Syzygium cumini*), fresh *Dravanti* (*Baliospermum montanum*), *Arka Dugdha* (Latex of *Calotropis procera*), and *Snuhi Dugdha* (Latex of *Euphorbia neriifolia*). The desired *Ratna* powder is put in the center of a ball of this paste, which is then wrapped in *Bhoorja Patra* (Birch Leaves). After that, a cloth is wrapped around it, and a thread is used to bind it. With *Dolayantra's* assistance, This *Pottali* is additionally exposed to *Swedana* in *Amla Tushodaka* (Sour Fermented Water) for three days. After being cleaned with hot water, the *Druti* is then gathered. [19]

Table No.2- Description of *Ratna Drutis*:

Name	Reference	Ingredients	Method
<i>Vajra Druti-1st</i> method	<i>Ratna Vijnana</i>	<i>Vajrakanda Swarasa</i> (<i>Synantherias sylvatica Schott</i>), <i>Snuhi Ksheera</i> , <i>Kadali Kanda Jala</i> (Banana's Bulb Water) <i>Navasadar</i> (Ammonium Chloride), <i>Trikshara</i>	<i>Sthapana</i> (Placing) for 15 days in <i>Bhoodhara Yantra</i> . [20]
<i>Vajra Druti-2nd</i> method	<i>Rasaratna Samuchchaya</i>	<i>Vajra valli Swaras</i> (<i>Cissus quadrangularis</i>), <i>Bhoorja Patra</i> (Birch leaves), <i>Amladravya Swaras and Kanji</i>	The powder (<i>churna</i>) of <i>Vajra</i> (diamond) is mixed into a smooth, round paste (<i>kalka</i>) using <i>Vajra Valli</i> (<i>Cissus quadrangularis</i>), This paste ball is then wrapped in a birch bark leaf (<i>bhurjapatra</i>).

			After that, it is covered with cloth and secured into a small bundle (<i>pottali</i>), The bundle is heated continuously for 7 days inside a <i>dolayantra</i> , which contains juice of sour substances (<i>Amladravya swaras</i>) and <i>Kanji</i> (fermented rice water). [21]
<i>Vaikranta Druti-1st</i> method	<i>Rasaratna Samuchchaya</i>	<i>Amlavetas Swaras</i> (Juice of <i>Garcinia pedunculata</i>)	The white-colored <i>Vaikranta</i> is treated (<i>Bhavana</i>) with <i>Amlavetas swaras</i> and then exposed to strong sunlight. This process is repeated seven times. [22]
<i>Vaikranta Druti-2nd</i> method	<i>Rasaratna Samuchchaya</i>	<i>Ketaki Swaras</i> (Juice of <i>Pandanus odoratissimus</i>), <i>Saindhava</i> (rock salt), <i>Swarnapushpi</i> (<i>Cassia fistula</i>), and <i>Indragopa</i> (a type of insect).	All the ingredients are taken in equal quantities, Grounded well to make a round shape ball. The <i>churna</i> of <i>Vaikrant</i> is kept inside this ball, Later <i>Dolayantra Swedana</i> is done containing <i>Amladravya</i> and <i>Kanji</i> (Fermented Rice Water) for 7 days. [23]
<i>Mukta druti-1st</i> method	<i>Rasaratna Samuchchaya</i>	<i>Amlavetas Swaras</i> (<i>Garcinia pedunculata</i>), <i>Jambirinimbu</i> (<i>Citrus jambhiri</i>)	The <i>powder</i> of <i>Mukta Ratna</i> is ground together with <i>Amlavetas</i> juice for seven days. After that, it is placed inside a <i>Jambirinimbu</i> (<i>Citrus jambhiri</i>) fruit, The fruit is then stored in a grain stack for seven days, On the eighth day, it is removed. Finally, <i>Sharavasamputa</i> is performed, followed by the application of heat (<i>Puti</i>). [24]
<i>Mukta Druti-2nd</i> method	<i>Ratna Vignan</i>	<i>Hingu</i> , <i>Tankana</i> , <i>Kaseesa</i> , <i>Navasadara</i>	Repeated <i>Nirvapana</i> and <i>Dravana</i> in <i>Nimbu Swarasa</i> . [25]
<i>Manikya Druti</i>	<i>Ratna Vignan</i>	<i>Trikshara</i> <i>Pancha lavana</i>	Repeated <i>Nirvapana</i> and <i>Dravana</i> in <i>Sudha Jala</i> (Lime water). [26]
<i>Praval Druti</i>	<i>Ratna Vignan</i>	<i>Ketaki Moola</i> (<i>Pandanus odoratissimus</i>), <i>chitraka mula</i> , <i>Saindhava</i> , <i>Narikelodaka</i> (Coconut water).	Repeated <i>Nirvapana</i> and <i>Dravana</i> in <i>Nimbu jala</i> (Lemon water). [27]

Table No.3- Description of *Rasavarga Drutis*:

Name	Reference	Ingredients	Method
<i>Abhrak Druti</i>	<i>Rasendra Chintamani</i>	<i>Dhanyaabhrak</i> , <i>Vajravalli Swaras</i> (<i>Cissus quadrangularis</i>), <i>Sauvarchala lavana</i> (Black salt)	Take <i>Dhanyaabhrak</i> along with <i>Vajravalli swarasa</i> and <i>Sauvarchala lavana</i> in <i>Sharava</i> and give <i>Mrudu agni</i> . This process is continued for 10-20 times to get <i>Abhrak Druti</i> . [28]
<i>Abhraksatva Druti</i>	<i>Rasendra Chintamani</i>	<i>Abhrak satva</i> (Mica powder), <i>Nija rasa</i> (Cows Urine), <i>Kanchukakanda Churna</i>	<i>Avapa</i> of <i>Kanchukakanda churna</i> in <i>Nija Rasa</i> . <i>Bhavana</i> of <i>Abhraka satva</i> in <i>Avachita nija rasa</i> for 100 times. [29]

		(<i>Synantherias sylvatica</i> Schott),	
<i>Makshik Druti</i>	<i>Rasaratna Samuchchaya</i>	<i>Makshik Satva</i> (copper pyrite), <i>Eranda taila</i> (<i>Ricinus communis</i> Linn), <i>Gunja churna</i> (<i>Arbus precatorius</i> Linn), <i>Madhu</i> (honey), <i>TankanaKshara</i> (Borax).	<i>Dravikarana</i> of <i>Makshik Satva</i> in <i>Musha</i> . Take all remaining ingredients in equal quantity and mix it with <i>Dravita Makshik satva</i> , By doing this <i>Makshik</i> remains in liquid form only. [30]
<i>Gandhak Druti</i>	<i>Rasaratna Samuchchaya</i>	<i>Purified Gandhak Churṇa</i> , <i>Trikatu churṇa</i> , <i>Tila taila</i> (Sesae oil), clean silk cloth, cotton thread, <i>Sandamsa Yantra</i> .	One clean silk cloth of one square <i>Aratni</i> (Distance between elbow joint and little fingertip) (16.5 inches or 41.91cm) is taken, It is spread out on a clean surface and over that the mixture of <i>Suddha Gandhaka Churṇa</i> (1 part) and <i>Trikatu churṇa</i> (1/16" part) is evenly spread, This cloth is rolled like a wick and tied with a cotton thread on either ends and in the middle to avoid the spillage of the powder, This <i>Varti</i> (Suppository) is kept in the <i>Tila Taila</i> (Sesame oil) for one <i>Prahara</i> (i.e 3 hours). Later the wick is held in the middle with the help of <i>Sandamsha Yantra</i> , soaked in the oil and ignited from one end. The drops of oil that trickle down from burning <i>Varti</i> (Suppository) are collected in a vessel placed beneath. This thick and blackish oil is later stored in suitable airtight container as <i>Gandhaka Druti</i> . [31]

Storage of *Drutis*:

Druti is to be stored in glass containers, particularly *Ratnadi Drutis* in *Kusumbha Taila* (oil of *Carthamus tinctorius*) . [32]

So the preservation of *Druti* is done in *Kusumbha Taila* as *Druti* is heavy and non-miscible in oil, so it will settle down in *Taila*. Hence it will not to be exposed in the atmosphere and oxidation will not take place resulting in preservation for longer time.

3. DISCUSSION

Druti kalpana is described for *Dhatus* and substances containing *Dhatus*. Classical texts explain not only how to prepare *Druti* but also how to mix different *Drutis* for

various uses, especially in mercury processing, as explained by many *Acharyas*. However, later texts like *Rasaratna Sammucchaya* (2/50) and commentary on *Ayurveda Prakash* (1/253) show that making *Druti* is a difficult process and is not explained in detail. It is believed that the success of this preparation depends on the blessings of Lord Shiva, *Ratna Druti* is mentioned in classics since 10th century AD but the same is absent in many classics of 20th century AD. [33] Despite these challenges, *Druti Kalpana* remains as an important part of *Ayurvedic* practices and is not considered to be endangered. With continued efforts in research,

education, and standardization, it can continue to contribute the rich heritage of *Ayurvedic* medicine.

4. CONCLUSION

Druti Kalpana is noticed as one among endangered formulations, which are not found in the practices or in the pharmaceutical preparation by any pharmacy. Even though references of *Druti Kalpana* are mentioned in texts of *Rasashastra* but they are not used in current clinical practice. This makes misconception or lack of belief in *Shastra Vachana*. *Druti Kalpanas* were explained in classics in the management of acute and chronic ailments. These formulations are similar like Nano suspension of present biotechnological pharmaceuticals.

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