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Critical Review of *Tankana* According to Ancient and Modern Aspects

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Abstract

Rasashastra is a valuable stream that deals with the study of various procedures and the therapeutic utility of mercury, metals, minerals, and other such drugs. *Tankana* is an important drug described in *Rasashastra*, having its reference in early classical texts of *Ayurveda*. *Rasashastra* comprises the study of raw material, identification, various procedures, and the therapeutic utility of mercury, metals, minerals, and other such drugs. Formulations of *Rasashastra* have become more popular due to their efficacy and potent results in small quantities.

So, it is mandatory to preserve the standardization of the raw drug to assess parameters for identity, purity, quality, and efficacy of the final formulation. *Tankana* has a unique role and has been kept under the *kshara* (alkali) *varga*, described as *ksharshresta*. Chemically, it is sodium biborate. It is then purified to get *Tankana*. Borax contains sodium and boron. Boron is an essential element for dietary intake for human beings. *Tankana* has great therapeutic uses as a potent expectorant, anti-inflammatory, digestive, diuretic, and antimicrobial, and it is well known as an antidote for *Aconitum ferox*. This is a primary attempt to present a study on the critical review and therapeutic value of *Tankana*.

Keywords

Tankana, Borax, *Ayurveda*

Introduction

Alkali *Tankankshara* has a tendency to produce dryness in the organism, generate *vayu*, cause derangement of *Pitta*, subdue *Kapha*, and is appetizing in its properties. It is sharp in its potency.[1] Chemically, *Tankan*-Borax is $Na_2B_4O_7·10H_2O$. According to *Ayurved prakasha* and *Rasendrasar sangraha*, *tankan* is classified in *Kshartray*, *Ksharpanchak*, and *Dravakgan Mitrapanchak*.[2] It is also known as *Kshararaj*, *Suhaga*, *Dravak Saubhagya*, *Ksharshreshtha*, *shvetkshar*, *Khadiokhar*, and *Sitkshar*.[3]

It is procured from salt lakes in the form of crystals, usually obtained from Searle's Lake in California and Leh of Jammu & Kashmir.[3] In

samhita, *Sushrutacharya* described *tankana* with its pharmaceutical properties in the *Sushrutasamhita* for the first time. *Tankana* is a cost-effective, abundantly available, and safe medication, but assessing its quality and identifying *Tankan*, especially types having *grahya lakshana* (acceptable standard samples of *tankan* which are available today), is a challenging job; therefore, raw material standardization is required.

Aim and Objectives

- To review the literature of *Tankana* (borax) from *Ayurvedic* and modern aspects.
- To explore the use of *Tankana*.

Methodology

Classical texts of *Ayurveda*, texts of *Rasashastra*, modern texts, previous research work, research journals, and the internet were thoroughly reviewed.

Discussion

Tankanakshara has been described with its therapeutic properties since the *Samhita* period. In *Bhrihatrayee*, the *Sushruta Samhita* introduced *Tankana*. According to *Acharya Sushruta*:

Virukshano anilkar: shlesmaghna pittadooshana: | Agnideeptikarsteekshna Tankanakshar uchyate ||Su.Soo.46|327

The alkali known as *Tankanakshara* (Borax) tends to produce a condition of dryness in the organism, generates *vayu*, subdues *kapha*, and is appetizing in its property.[4] Many references are available thereafter in *Rasashastra* texts; *Tankana* is abundantly used in many processes in *Rasashastra*. *Tankana* is described under the classification of *Uparasa varga* in *Ayurved Prakash*, *Rasendrasarsangraha*, and *Rasamanjiri*. It is known as *Ksharshresta*. Moreover, it is known to bring about a derangement of *Pitta* and is sharp in its potency.[4] Chemically, *Tankana* is Borax ($Na_2B_4O_7,10H_2O$). It is also known by synonyms according to the *Rasatarangini*: *Kshararaja*, *Suhaga*, *Saubhagya*, *Ksharshrestha*, *Svetkshar*, *Dravak*, *Khadiyokhar*, and *Sitkshar*.[5] *Tankana* is included under the class of *Kshartraya*, *Ksharapanchak*, *Dravakgana*, and *mitrapanchak*.[6] It is obtained from crystals around salt lakes, Searle's Lake in California, Leh of Jammu & Kashmir, and Rajasthan.[7]

In the *Samhita* period, within the *Bhrihatrayee*, the *Samhita* introduced *Tankana*, which was then abundantly used in many processes in *Rasashastra*. The textbook of *Rasashastra* quotes the use of *Tankana* in many formulations mentioned in the *Charaka Samhita Chikitsasthana*. However, even though a thorough search was done, it was not possible to find a reference to *Tankana* or its synonym in the *Charaka Samhita*. *Tankana* is introduced in the *Sushruta Samhita* specifically with properties to produce dryness, be appetizing, sharp in potency, and therapeutic uses to produce *vayu*, subdue *kapha*, and cause derangement of *pitta*.[8] In the *Laghutrayee*, *Tankana* is recurrently used in the *Sharangdharasamhita*, e.g., for application with honey (*Sha.sa.ma.kha.7 /95*), *Dhatu shodhan marana kalpana - Shodhana* (*Sha.Sa.Ma.kha.11/59*), *Sattvanirman* from *Updhatu* 11/77, and *Rasadishodhan maran kalpana* 12/58.[9]

In the *Sangraha* Period, almost all *Rasashastra* texts quote *Tankana*; it is also used widely in various processes like *shodhana*, *marana*, and *satvapatana*, as well as being indicated for its importance in therapeutic uses.

Table no. 1: *Tankana* quoted in various processes and descriptions in *Rasashastra* classical texts

Sr. No.	Period	Name of text	Use in process / Description of *Tankana*	Reference
1	12th C.	*Rasarnava*	*Trikshara*, *Dravanpanchaka*, *Shodhantritraya*, *Ksharastaka*, *Vidnirmana*	*R.4/47, R.5/30, R.5/41, R.5/42, R.6/34, R.9/7*
2	12th C.	*Rasendra chudamani*	*Rasaka*, *Satvapatan*, *Dipan sanskara*, *Parada bubhukshikarana*, *Abhrakasatvapatan*	*R.Chu.10/118, R.Chu.15/56, 67, R.Chu.16*
3	13th C.	*Rasaratnakara*	*Divyadehaprapti*	*R.R.T.3/30, 32*
4	13th C.	*Sharangdhara Samhita*	*Dhatushodhan marana kalpana*, Therapeutic uses	*Sha.Sa.Ma.kha.11/59*
5	14th C.	*Rasaratna samucchaya*	*Apunarbhava*, *Kshara traya*, *Vid varga*, *Shodhaniya Gana*, *DravanVarga*	*R.R.S.8/28, R.R.S.10/68, 87, 93, 95*
6	14th C.	*Rasendrasar sangraha*	*Uparasa*, *Ksharvarg*, *Dravaka Gana*	*R.S.S 1/118, 119*
7	14th C.	*Rasendra Chintamani*	*Mitrapanchaka*	*R.Chi.4/9*
8	16th C.	*Bhavaprakash*	*Mishraprakaran*, Synonym, properties, *Gulmadhikar*, Therapeutic Uses	*Bha.Pra.Purva khanda 135, 136, Madhyamakh anda 32/35-41*
9	17th C.	*Ayurved Prakash*	*Uparasvarga*, Synonym, properties, Effect of *ashudha Tankana* and *shodhana*, *Grahyagrahyatva*	*A.P.2/1, A.P.2/243, A.P.2/244*
10	17th C.	*Rasakamdhenu*	*Ksharvarga*	*R.K.D.4/175*
11	17th C.	*Rasachandanshu*	Types, *Grahyagrahyatva*, Properties, *Shodhana*, Classification	*R.Ch.67-69, 316-319, 638*
13	18th C.	*Yogratnakara*	*Shodhana*	*Y.R.165*
14	19th C.	*Bhaishajya ratnavali*	Various formulations	*B.R.*
15	20th C.	*Rasatarangini*	Classification, Synonym, *Nirmalikarn*, properties and uses	*R.T.13/74, 77, R.T.13/79-88, R.T.2/6, 35, 37*

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16	20th C.	*Rasajalanidhi*	Synonym, Types, *Guna*, *Shodhana*, *Makshikshodhana*, *Shodhaniya Gana*	*R.J.N.part3 5/274, R.J.N.7/212, 216, 217*
17		*Dhanvantari Nighantu*	Classification	*D.Ni.7/66, 69*
18		*Raja Nighantu*	Properties of *Shwet Tankana*	*R.Ni.242*
19		*Priya Nighantu*	*Suvarnadi varga*	*P.Ni.158*
20		*Nighantu ratnakar*	*Gunadosh prakaran*	*Ni.R.91*

Types of *Tankana*-

1. Based on occurrence – According to *Ayurvediya rasashastra*: a) *Khanija* b) *Kritrim*[10]
2. Based on place – *Rasadhatu Prakash*: a) *Swayambhu* from Tibet, Nepal b) *Banavati* c) *Pashan* (potash salt)[11]
3. On the basis of availability – According to *Ayurvediya rasashastra*: a) *Sonari* b) *Chaukiya*
4. On the basis of physical appearance – According to *Ayurvediya rasashastra*: a) *Telia* b) *patiya*
5. On the basis of *Grahyaagrahyatva* – According to *Ayurved Prakah*, *Rasachandanshu*, *Bruhadrasaraj sundar*: a) *Sphatikabh* b) *Pandur* c) *Gudprabha*[12,13,14]
6. On the basis of color – According to *Rasajalanidhi*: a) *Pinda* b) *Shadam*[15]

Texts quote the qualitative grades of types of *Tankana* as:

- *Pandur* / *Nilkantha* - 1) *Uttam* (Best) 2) *Sphatikabh* – Moderate 3) *Gudprabha* – worst – According to *Ayurved Prakash*[12]
- *Pandur* is a type of *Tankana* which is of the best quality and useful in medicinal procedures.

Properties of *Tankana*: *Rasa – Katu*, *Virya – Ushna*, *Vipaka – katu*. It is *laghu*, *Ruksha*, *Ushna*, *Tikshna*, *Katu*.[16,17]

Karmukatva[18]: *Hridya*, *Vishaghna*, and *Deepaka* are the main functions of *Tankana* quoted by *Rasatarangini*, *Ayurved prakash*, *Rasaratnasamucchaya*, *Rasamrut*, and *Yogratnakar*. *Karmukatva* of *Tankana* is described as *Balya*, *Rajapravartak*, and *moodhagarbhapravartak* by *Rasatarngini*, *rasamrut*, and *Rasaratnasmucchaya*. In *Bruhad rasaraj sundar*, *Vishaghna*, *shoolaghna*, *dravi*, and *bhedi* are mentioned.

Effects of impure *Tankana*[19]: According to *Ayurved Prakash*, vomiting and delusions are effects after intake of impure *Tankana*.

Shodhan: To avoid the ill effects of the intake of *ashuddha Tankana*, prepare it in powder form and heat it in an iron pan to remove impurities, evaporating the water content until a white light form is achieved.

1. Fried in a pan to turn into *lahi*/hollow structure[19,20,21]: In this process, *Tankana* is fried in a pan to turn into *lahi*/hollow structure; this is described in *Rasa Tarangini*, *Ayurved prakash*, and *Yogaratnakar*. This process is simple and easy and hence commonly used.
2. Fried in a pan[22]: According to *Rasamruta*.

3. Add water to *Tankana*, decant, and heat on a fire[22,23]: According to *Rasamrut* and *Rasajalanidhi*.
4. Dip in *Kanji* for a night and dry in the sun[24,25]: According to *Rasaratnasamucchaya* and *Rasendrasarsangrah*.
5. Keep *Tankana* in *Jambir rasa* for 24 hours[26]: *Bruhadrasrajsundar*.
6. Mix with *Gomay rasa*[26]: *Bruhadrasrajsundar*.
7. Mix with urine of cow and mix with *Jambirrasa* (*Citrus limon*) in a coconut, mix with *Piper nigrum*, and then wash with water[27]: *Rasendrasarsangrah 1/248-250*.

Matra: 1-2 *ratti* ***Anupan***: *Madhu*, *Ghruta*

Therapeutic Action: As a single drug, *Tankana* is very important due to its wide range of therapeutic action. It possesses antidote properties for the toxicity of *Vatsanabha* (*Aconitum ferox*). Therefore, many herbomineral compound drugs have *Tankana* as one of their ingredients exclusively.[28] According to *Rasashastra*, *Tankana* is the best in *dhatudravan* and is also useful as a *Parad vikar nashak*.[29]

Tankana is used in various *Rasakalpas* like *Anandbhairav Rasa*, *Mrityunjaya Rasa*, *kanaksundar Rasa*, *prataplankeshwar Rasa*, *Rajapravartini Vati*, *Loknath Rasa*, etc. There is a wide range of formulations of *Tankana* in *Bhaishajya Ratnavali*, *Bharat Bhaishjya Ratnakar*, and *Rasayogasagar*. In *Yogratnakar*, *Samirpannag rasa*, *Shwaskuthar rasa*, *Sootshekhar rasa*, and *Tribhuvan kirti Rasa* are described in detail using *Tankana*. In *Bhaishjya Ratnavali*, many formulations are described such as *Amrutarnavrasa*, *Amrutmanjirirasa*, *Agnikumarrasa*, *Ardhanarishwar rasa*, *Jaymangal rasa*, *Kravyad rasa*, *Laxminarayan rasa*, *Mahashankh vati*, and *Panchvaktra rasa*. In *Bhaishjya Ratnavali*, *Pardadi dhoopan* is used externally for wound healing with the help of *Tankana*.[30]

Tankana has a unique role in various procedures in *Rasashastra* (According to *Ayurvediya Rasashastra*), viz. 1) *Paradvedhasamskar*, 2) *Paradbubhukshikaran*, 3) *vidadi-mukhakaran*, 4) *Apunarbhava* test for *bhasma*, 5) *Satvapatan* test, 6) *Dhatushodhan*, 7) *Dhatuvilayan* of gold and silver.[31] Therapeutic uses of *Tankana* are through various routes of drug administration. *Tankana* is used externally for *mukhadhavan*, *yonidhavan*, *karnadhavan*, *basti*, *uttarbasti*, and *vranaghna* (wound healing). It is used in delayed labor along with ergot, as it acts on uterine contractions. According to the *Rasatarangini*, *Tankana* specifically gives a peculiar action on various diseases when combined with other drugs. For example, *Tankan* mixed with honey and *trikatu* decreases pain in the abdomen (*R.T.13/87*).[32]

The *Ayurvedic* Pharmacopoeia of India quotes, '*Tankana* (borax) is used mainly for *shwas* (asthma), *kasa* (cough), *vatarog* (diseases due to *vatdosh*), *sthavaravish* (poisoning by plant and mineral), *adhmana* (flatulence with gurgling sound), and *vrana* (wound, ulcer). With honey, it is used in stomatitis.[33] According to the Indian Materia Medica, Borax is diuretic, emmenagogue, astringent, antacid, local sedative, and antiseptic. Borax is useful for external application in urticaria and piles.[34]

Evaluation of Borax as per modern aspect

OCCURRENCE – According to Wikipedia, Tincalconite is an anhydrous sodium borate mineral closely related to borax. Its formula is $Na_2B_4O_7·5H_2O$ or $Na_2 [B_4O_5 (OH)_4]·3H_2O$. While most tincalconite is created by man through exposing borax to dry air, there are natural occurrences of tincalconite, such as in Searles Lake, California, as first described in 1878. In addition to several California and Nevada locations, it is reported from Argentina, Italy, Turkey, and Ukraine. The name comes from "*tincal*", Sanskrit for borax, and Greek, "*konis*",

meaning powder, for its composition and typical powdery nature. According to API, Borax is Sodium Borate, the mineral salt of Boric acid. *Tankana* occurs naturally by volcanic emanations (*fumaroles*), hot springs, and dried-up shallow basins (*playa*). It also occurs naturally under the trade name Rasorite 46, refined by recrystallization.[35]

ORIGIN-[36], [37] The origin of *Tankana* involves simple concentration and evaporation, which is accompanied by some chemical and mineralogical transformation to give rise to *Tankana*.

ASSOCIATION-[36], [37] As an evaporate mineral, it occurs associated with halite, sulfates, carbonates, and other borates like ulexite and colemanite.

At present need fulfilled by import – Deposits of *Tankana* are not yet discovered in India; domestic need is met by imports of crude borates which are refined to produce *Tankana* and boric acid. It is composed of boric acid and soda. In its native state, it exists as an impure saline incrustation of a dirty white color.

NATURAL SOURCES- [35],[36],[37] Occurs naturally; deposits are produced by repeated evaporation of seasonal lakes. Most commercially important deposits are found in Turkey (Boron), California, the Southwestern United States, the Atacama Deserts in Chile, Tibet, Bolivia, and Romania. Borax is also produced synthetically from other boron compounds. Naturally occurring borax, known by the trade name Rasorite-46 in the United States and many other countries, is refined by a process of recrystallization.

PREPARATION OF BORAX[35],[36],[37] – Most borax is prepared from natural borax of lake borax or from minerals like colemanite ($Ca_2B_6O_{11}·5H_2O$), Boracites ($2Mg_3B_8O_{15}MgCl_2$), etc. According to *Ayurvediya Rasashastra*, the preparation of borax involves minerals such as colemanite being ground to a fine powder and boiled with sodium carbonate solution for three hours. 15 parts of minerals + 10 parts of Na_2CO_3 + 60 parts of water $2[2CaO, 3B_2O_3] + 3Na_2CO_3 = 3CaCO_3 + CaO + 3Na_2B_4O_7$ The solution is filtered and allowed to crystallize for 3 days. Thus, Borax is drained, broken up, and packed.

CHEMICAL STRUCTURE Borax = Sodium Tetraborate Molecular formula: $Na_2B_4O_7·10H_2O$

- Transparent, colorless crystal; white, crystalline powder.
- Saline, alkaline, odorless.
- Taste: Sweetish.
- Soluble: In 25 parts of cold water.
- Insoluble: Borax is insoluble in equal parts of glycerin, as well as insoluble in alcohol.
- Effloresces in dry air.
- On ignition, loses all its water of crystallization.[35]

ADULTERANTS – Adulteration of milk, chalk powder, and other food articles with these drugs is regarded as noxious and injurious to health, though there are no ill effects from swallowing them in small dosages.

ECOLOGICAL INFORMATION – Naturally occurring sources: Sodium tetraborate $Na_2B_4O_7$ usually occurs as borax, which is a decahydrate mineral; colemanite and kernite.

ENVIRONMENTAL FATE – Terrestrial fate: Average persistence at recommended rates is one or more years, depending on soil type and rainfall. It is less persistent in acid soils and in high rainfall areas.

TOXICITY – Borax is non-irritating to the eyes in normal industrial use.

SIGN AND SYMPTOMS – Nausea, vomiting, and diarrhea, with the delayed effect of a skin rash on accidental overexposure to chemically related substances.

PHYSICAL PROPERTIES- [35]

- Nature: Crystalline
- Color: White
- Taste: Sweetish alkaline
- Cleavage: Poor
- Fracture: Conchoidal
- Luster: Vitreous
- Density: $1.73 g/cm^3$
- Tenacity: Brittle
- Melting Point: $743°C$ ($1,369°F$)
- Boiling Point: $1,575°C$
- Streak: White
- Hardness: 2 to 2.5
- Transparency: Translucent
- Specific gravity: 1.65 to 1.7

CHEMICAL PROPERTIES[35]

1. **Effect of heat:** When *Tankana* is heated on a flame: 1) *Tankana* bubbles up. 2) It fuses to a clear glassy bead. 3) The color of the flame of *Tankana* appears yellow because of sodium; when moistened with sulfuric acid and alcohol, it gives a green flame because of boron.
2. **Reaction with acids:** 1) With HCl: In cold conditions, a yellow solution. 2) With H_2SO_4: In cold conditions, a colorless solution.
3. **Solubility in water:** 1) *Tankana* is completely soluble in purified water. 2) *Tankana* mixed with water gives an alkaline solution; when litmus is dipped in the solution, red litmus turns blue. 3) **Solubility in alcohol:** Insoluble in alcohol.

USE-[35], [36], [37], [38], [39] Borax is diuretic, emmenagogue, astringent, and antiseptic. Borax is useful for external application in urticaria and piles. According to *The Essential Guide To Vitamins And Minerals*, boron plays a very important role in bone strength and ossification, and it is a main ingredient in borax. In industrial products, borax is used for household laundry cleaning, in hand soaps, and in detergents. Borax is used for glazed glass and porcelain. It even keeps away ants and other pests. According to inorganic chemistry, borax is used as a germicide and bacteriostatic. It is used in a few commercial dermatological preparations and is also used as an ophthalmic ointment. It is used in fiberglass textiles and as a flame retardant for fabric and wood. It is used as a flux in bronzing and silvering, in making enamel, and in leather tanning.

*** Discussion-**

- As a single drug, *Tankana* is very important due to its wide range of therapeutic action.
- It possesses antidote properties for the toxicity of *Vatsanabha* (*Aconitum ferox*). Therefore, many herbomineral compound drugs have *Tankana* as one of their ingredients exclusively.

Conclusion

- *Tankana* is well known from the *samhitakaal*.
- Especially the therapeutic properties of *tankana* are highlighted by the *Sushrut Samhita*.
- *Tankana* is described in nearly all *rasagranthas*. *Tankana* is classified under *Uparasvarg* according to *Rasendrasarsangrah*, *Anandkand*, and *Ayurved Prakash*.
- *Tankana* has a unique role in various procedures in *Rasashastra* (According to *Ayurvediya Rasashastra*), viz. 1) *Paradvedhasamskar*, 2) *Paradbubhukshikaran*, 3) *vidadi-mukhakaran*, 4) *Apunarbhava* test for *bhasma*, 5) *Satvapatan* test, 6) *Dhatushodhan*, and 7) *Dhatuvilayan* of gold and silver.
- It is used internally and also externally.

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- According to *The Essential Guide To Vitamins And Minerals*, boron plays a very important role in bone strength and ossification.
- *Tankana* is abundantly available and very easy to use after a simple method of purification.

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