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## **A Review on Water Purification with special reference to Susruta Samhita**

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### **ABSTRACT**

Water pollution is one of the major pollution faced by the 21<sup>st</sup> century. Much disease has been known related to water pollution. Water pollution has gained lime light since industrial revolution but it has its origin since ancient times. Ayurveda, science of life, comprises of both preventive and curative aspect, deals with various aspects of life which maintains it. Water, one of the essentials for sustaining life on earth, ayurveda classics hence included detailed explanation about *jala*, *dushitha jala*, *visajusta jala* and purification of contaminated water are mentioned. This article details about various purification methods of water mentioned in *susruta samhita*.

### **KEYWORDS**

*Jala, JalaShudikarana, WaterPollution, VisajustaJala*



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## INTRODUCTION

Earth is called the blue planet, the name so acquired is from the availability of water in different form on the planet. All known life forms depend on water for its survival. Water is a finite source. But, the Earth cleans and replenishes the water supply through the hydrologic cycle<sup>1</sup>. When the contaminants are excess and unidentifiable by the natural process of cleaning then pollution occurs. Water used for human consumption should be both safe and wholesome. This has been defined as water that is free from pathogenic agents, free from harmful chemical substance, pleasant to taste, i.e., free from colour and odour and usable for domestic purposes<sup>2</sup>.

There is a vast explanation about *jala* in ayurveda. Different classical books of ayurveda explain potable water, poisoned and polluted water, ill effect due to consumption of polluted water, its treatment and water purification. *Susruta samhita*, one among the *bruhratrayas* explains about *jala* in the chapter 45 of *sutra sthana* and purification of poisoned water in the chapter 3 of *kalpasthana*. Potable water helps in quenching thirst, good for heart and is nourishing. While drinking impure water leads to various illnesses.

### Causes of Polluted water (table 1)

According to *Susruta samhita*, The water which is covered by mud, green moss, floating plants, straw and lotus leaves etc. or which is not exposed to rays of the sun, moon and to the air, or which has developed an odor, color or taste, that water becomes contaminated and this water is likely to develop six types of defects relating to *sparsa* (touch), *roopa* (appearance), *rasa* (taste), *gandha* (odour), *veerya* (potency) and *vipaka*<sup>3</sup>.

**Table 1** *Shaddosha of Jala*

Shaddosha of Jala	Characteristics
Defects of <i>sparsa</i> (touch)	Hardness, sliminess, hotness, peculiar sensation in the teeth
Defects of <i>roopa</i> (shape)	Varied coloration due to mud, sand etc.
Defects of <i>rasa</i> (taste)	Development of a taste
Defects of <i>gandha</i> (smell)	Disagreeable odour
Defects of <i>veerya</i> (potency)	Thirst, heaviness, colic, expectoration of kapha
Defects of <i>vipaka</i>	Delayed digestion, <i>vishtambha</i>

Water which is contaminated by poison are told to have following features like the water will be slimy, has strong odour, peculiar taste, frothy, with streaks, where aquatic animals die, birds get intoxicated and if humans or animals come in contact with such



water, they will suffer from fever, burning sensation and swelling<sup>4</sup>.

### Different Water Purification Methods in Susruta Samhita Saptavidha Jala Prasadana- Seven cleansing agents for water<sup>5</sup>

1. *Kataka* (table 2) :(*Strychnos potatorum Linn*), is indicated in water purification. The crushed seeds of *kataka* act as coagulants for purification of water.

**Table 2** Description on *Kataka* (*Strychnos potatorum Linn*)

Botanical name	<i>Strychnos potatorum Linn</i>
Family name	Loganiaceae
English name	clearing nut tree
Part used	Seed
Rasa	<i>Madhura</i> (sweet), <i>kasaya</i> (astringent), <i>tikta</i> (bitter)
Guna	<i>Guru</i> (heavy)
Virya	<i>Sheeta</i> (cold)
Vipaka	<i>Madhura</i> (sweet)
Uses:	<i>Vishgna</i> (anti-poisonous), <i>jalanirmaleekarana</i> (water purifier)

2. *Gomedaka* (Hessonite) is Calcium AluminumSilicate ( $\text{Ca}_3 \text{Al}_2 \{\text{SiO}_4\}_3$ ), is one among *navaratnas*.According to *rasa shastragomeda* is identified as Zircon, and some consider it as Cinnamon stone(Hessonite) and some as Alexandrite. It is *kapha pitta samanatwa deepana* and *ruchya* in nature. Various study conducted on the effectiveness of *gomeda* in water purification has shown positive results.

*Bisagrandhi* or root of *kamala*(lotus) is helpful in water purification. Various scientific studies have been done to determine the potential of *Nelumbo nucifera* in water purification (table 3). It was found that lotus has the capability in preventing eutrophication in pond by suppressing the growth of algae and also by removing nitrogen and phosphorus pollutants. It also helps in removing heavy metals from water. The results observed are impressive showing 96% of copper and 85% cadmium metals removed after a seven-dayincubationperiod<sup>6</sup>.

**Table 3** Description on *kamala* (*Nelumbo nucifera* Grernt)

Botanic al name	<i>Nelumbo nucifera</i> Grernt
Family name	Nymphaeace
English name	Sacred lotus
Part used	<i>Mula</i> (root)
Rasa	<i>Madhura</i> (sweet), <i>kasaya</i> (astringent), <i>tikta</i> (bitter)
Guna	<i>Lagh</i> u(light), <i>snigdha</i> (unctuous), <i>picchila</i>
Virya	<i>Sheeta</i> (cold)
Vipaka	<i>Madhura</i> (sweet)
Uses:	<i>Vishgna</i> (antipoisonous), <i>trsnanigrahana</i> (reduces thirst), <i>dahasamaka</i> (reduces burning sensation)

3. *Saivalamoola* or *Ceratophyllum demersum*(table 4) root is *sheetaveerya*,*laghuguna* and *pitta shaman* which helps in purification. Growing *C. demersum* in water showed positive effect in reducing the pollutant in the water. It showed



reduction in the concentration of Cu, Zn,Cd and Pb. It also helps in reducing BOD<sub>5</sub> and COD in water.

4. *Vastra* or a piece of cloth acts as a filterate. It helps in removing larger particles by getting it settled on the cloth. This is type of mechanical purification. It helps in removing dust particles insects etc. This type of purification is suitable for water obtained from Well's.

**Table 4** Description on *saivala* (*Ceratophyllum demersum* Linn.)

<b>Botanic al name</b>	<i>Ceratophyllum demersum</i> Linn.
<b>Family name</b>	Ceratophyllaceae
<b>English name</b>	Hornwort
<b>Part used</b>	<i>Panchanga</i> (whole plant)
<b>Rasa</b>	<i>Kashaya</i> (astringent), <i>tikta</i> (bitter), <i>madhu ra</i> (sweet)
<b>Guna</b>	<i>Laghu</i> (light), <i>snigdha</i> (unctuous)
<b>Virya</b>	<i>Sheeta</i> (cold)
<b>Vipaka</b>	<i>Katu</i> ( pungent)

**Table 5** Description about Dhavashwakarnadi Yoga

<b>Plants</b>	<b>Rasa</b>	<b>..Guna</b>	<b>Virya</b>	<b>Vipaka</b>	<b>Uses</b>
<i>Dhava(Anogeissus latifoliaRoxb)</i>	<i>Madhura</i> ( sweet), <i>kashaya</i> ( astringent)	<i>Laghu</i> (light), <i>rukṣa</i> (dry)	<i>Sheeta</i> (cold)	<i>Katu</i> (punge nt)	<i>Rakta pitta</i> (bleeding disorder), <i>visagna</i> ( anti poisonous)
<i>Ashvakarana(Dipteroc arpus alatusRoxb)</i>	<i>Katu</i> (pungent), <i>tikta</i> (bitter)	<i>Laghu</i> (light), <i>rukṣa</i> (dry)	<i>Usna</i> (hot)	<i>Katu</i> (punge nt)	<i>Kustagna, mutrala</i>
<i>Pribhadra (Erythrina indica Lam)</i>	<i>Tikta</i> (bitter), <i>Katu</i> ( pungent)	<i>Laghu</i> (light)	<i>Usna</i> (hot)	<i>Katu</i> (punge nt)	<i>Mutrakrichra, krimigna</i>
<i>Patala(Stereospermum suaveolens DC)</i>	<i>Tikta</i> (bitter), <i>kashya</i> (astringent)	<i>Laghu</i> (light), <i>rukṣa</i> (dry)	<i>Anusna</i> (not hot)	<i>Katu</i> (punge nt)	<i>Trisnanigrahana, chardinigraha, hikkanigraha</i>
<i>Sidhaka (Vitex negundoLinn),</i>	<i>Tikta</i> (bitter), <i>katu</i> (p ungent) <i>kashya</i> (astri ngent)	<i>Laghu</i> (light), <i>rukṣa</i> (dry)	<i>Usna</i> (hot)	<i>Katu</i> ( pungent)	<i>krimighna, ruchikara, vishaagnā</i> (anti- poisonous), <i>balya, rasyana</i>

**Uses:** *Trsnanigrahana*(reduces thirst),*dahasamaka*(reduces burning sensation)

5. *Mukta* or pearl is *Vishaghna* and *veeryavardhaka*.

6. *Mani* (potash alum), by immersing in polluted water, *mani* helps in removing pollutants from it.

### **Dhavashwakarnadi Yoga<sup>7</sup> (table 5):**

The cold ash of the following plants *Dhava(Anogeissus latifoliaRoxb)*, *Ashvakarana(Dipterocarpus alatusRoxb)*, *Pribhadra (Erythrina indica Lam)*, *Patala(Stereospermum suaveolens DC)*, *Sidhaka (Vitex negundoLinn)*, *Mokshaka (Schrebera sweiteniodesRoxb)*, *Rajadruma (Cassia fistula Linn)* and *Somavalka (Myrica esculenta* Buch-Ham) are mixed with the polluted water, which purifies the water. One *Anjali* (192gms) of the above said ash should be added to one *Ghata* (12 liter) of water.



<i>Mokshaka (Schrebera sweiteniodes Roxb)</i>	<i>katu</i> (acrid), <i>Tikta</i> (bitter), <i>kashaya</i> (astringent)	<i>Laghu</i> (light)	<i>Usna</i> (hot)	<i>Katu</i> (acrid)	<i>Kusta, pandu, antihelmintic, vishagna</i>
<i>Rajadruma (Cassia fistula Linn)</i>	<i>Madhura</i> ( sweet)	<i>Guru</i> (heavy), <i>mrudhu</i> (soft), <i>snighda</i> (unctuous)	<i>Sheeta</i> (cold)	<i>Madhura</i> ( sweet)	<i>Ruchikara, dahaprasamana</i>
<i>Somavalka (Myrica esculenta Buch-Ham)</i>	<i>katu</i> (pungent), <i>Tikta</i> (bitter), <i>kashya</i> (astringent)	<i>Laghu</i> ( light), <i>tikshna</i> ( sharp)	<i>Usna</i> (hot)	<i>Katu</i> (punge nt)	<i>Rucya, jwaragna</i>

### Jalashodana<sup>8</sup>:

The purification of contaminated water can be done by

- a) Agni Kwathita(boiling)
- b) *Suryatapapratapana* (Exposed to the sun rays)
- c) Immersing heated iron balls, sand or stone into the water
- d) Removing bad odour by adding flowers likenaga (*Meusaferrea*) campaka (*Magnolia champaca*), utpala (*Nymphaeanucifera*), patala (*Stereospermumsuaveolens*).

methods mentioned in *SusrutaSamhita* are already under practice or still unknown to the modern world. If scientific studies are done on these methods and proved efficient in purifying the water, it can be made readily available to the society. Moreover, certain area of the world still lack purification methods due to its high cost. The methods mentioned by *Acharaya Susruta* are cost effective, easy to follow and reproducible with minimum ill- effect to the nature and human health. So these methods needs to be revived and brought into practice.

## DISCUSSION AND CONCLUSION

Intake of contaminated water has been associated to various illnesses in the body. Various water purification methods are used in today's world. Both ancient and modern technologies are known to be practiced for water purification. Each method used for the purification is based on the pollutant needed to be removed from the water. Most of the



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