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CRITICAL REVIEW ON KSHAR KALPANA AND ITS ANALYTICAL PARAMETERS

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INTRODUCTION

Kshar is generally called as alkali. But the chemical nature of all the kshara need not be alkaline. Usually kshara is prepared by burning the dry herbs in open air (complete combustion). The ash thus obtained is filtered and the liquid is subjected to heat to obtain kshara at the bottom of the vessel. Soluble part of the ash is dissolved in water and is collected at the end after all the water is dried. Hence kshara is nothing but the water soluble part of the ash.[1] Important of kshara, the disease which are difficult to treat can be cured by kshara, various types of skin ailments can be cured due to its lekhana property, in rasa shastra, kshara play its own role in different pharmaceutical procedure like shodhana, marana, jarana etc., kshara acts as an antidote ex. Tankana kshara acts as an antidote for vatsanabha.

General Method of Preparation Of Kshara[2]

The selected plant for the preparation of kshara is collected in appropriate season including all the panchang (root, stem, leaves, flower, & fruit).

The plant is entirely dried under hot sun until it is completely dry. This dry plant is cut into smaller pieces and taken in a wide mouthed big iron vessel and ignited in an open place.

After the drug is completely burnt, the ash is allowed to cool down on its own. This plant ash is filtered through a sieve to get rid of unburnt woody part. The obtained ash filtrate is now dissolved in 6 parts of water, cows urine or the mixture of the both. The mixture is stirred well and kept undisturbed over night. Next morning the 'supernatant clear liquid' is carefully decanted into a separate clean stainless steel vessel. It is now filtered through a clean cotton cloth for 21 times. Specification of 21 times filtration is perhaps to obtain the purest form of kshara.

The final filtrate is taken in an open large iron vessel and boiled with constant stirring. When the boiling liquid turns brown, slimy, clear and pungent smelling, it is removed from the fire and allowed to settle. Now the clear supernatant liquid is carefully decanted again and this decanted liquid is called ksharodaka. It can beused for both pharmaceutical as well as therapeutic purposes.

Form here on if the obtained ksharodaka alone is subjected for further boiling to get it in paste or dry powder form, it will be called as **mridu kshara**.

If the obtained ksharodaka is subjected for further boiling by adding the drugs such as limestone, burnt limestone, shanka and shukti to get it in paste or dry powder form it will be called as **madhyam kshara.**

If the obtained ksharodaka is subjected for further boiling by adding all the drugs used for madhyam kshara, along with the fine powders of the herbal drugs like danti, dravanti, chitraka, languli, putika and hingu and the mineral drugs like pravala, vida lavana and sauvarchal lavana to get the ksharodaka in paste or dry powder form, it will be called as **teekshna kshara.**

Common Qualities of Ksharas

Qualities: Piercive

Potency : Hot

Action : Brings about burning action, effective in Haemorrhoids, Gulma, Spleen disorder, Dysuria, Calculi, Worms (external & internal). It stimulate kidneys and act as diuretic. Upon external application, it ripens the inflammation, cleanses and heals wound.

As per the opinion of sushruta kshara are not too teekshna, not too mild. They are white in color, smooth, slimy and non spreading in nature. They are wholesome and quick acting.[3]

According to charaka all kshara are teekshna, ushna, laghu, ruksha, kledi, varna pachak, vran vidarak, and agni dipaka. In total kshara will have properties as that of agni.[4]

Rasa tarangini mentions the properties of kshara as teekshna, ushna and dhahkarma. They are indicated in gulma, grahni, pleeha, mutra kriccha and ashmari. They eradicate bahya and abhyantar krimi.[5]

TYPES OF KSHARA[6]

1. **Two types:** Depending on their use

Paniya kshara	Internal use (ksharodaka)
Pratisarniya kshara	External use (Mridu, Madhyam & Teekshana)

2. **Three types :** Depending on their source of origin

Khanija Kshara (Mineral source)	a. Naisargika : Sarja, Surya, Tankan Kritrima : Sodium borate
Pranija Kshara (Animal source)	Shanka, shukti, Praval, Kapardika
Vanaspatik kshara (Plant	Chincha, Arka, Palash Kshara

3. **Three types:** Depending on their strength

Mridu kshara	With mild Ksharan property
Madhyam kshara	**With moderate Ksharan property**
Teekshana Kshara	With high Ksharan property

4. **Kshara are identified in groups as below**

KSHARAS	COMPONENTS
Kshara dwaya	Yava, Sarja
Kshara traya	Yava, Sarja, Tankana
Kshara panchaka	Yava, Sarja, Tila nala, Palasha, Mushka
Kshara ashtaka	Yava, Sarja, Tila nala, Palasha, Sudha, Apamarga, Chincha, Arka

1. **Yava Kshara (Alkali of Barley, Hordeum Vulgare)[7]**

A) Synonyms – Yavakshaara, Yaavashooka, Yavaagraja, Yavaapatya, Yavaja, Yavashookaja, Yavya.

B) Introduction

- When barley grains are fully ripen, then whole plants are collected, sun dried, burnt in open air.
- The ash is taken in a big vessel, added with 8 parts of water, stirred and kept undisturbed.
- After sometimes, it is filtered across a cloth for 21 times.
- Next morning the filtered liquid is subjected to heat. The solid remnant ash part at the bottom of the vessel is yavakshara.

C) Qualities

Taste	Pungent
Potency	Hot
Effect on dosha	Mitigates kapha
Action	Effective against cardiac disorders, Anemia, Sprue, Spleen & Liver Disorders, Fullness of abdomen.

2. SWARJIKA KSHARA

A) Synonyms – Swarjika kshara, Suvarchika, Svarji, Svarjaka, Sarjjee, Suvarchaka, Suvarcha, Sukorjika, Roochaka.

B) Introduction - The Swarjika is a plant available at sindh area of Punjab. Some opine that the plant is collected from seashore and some other opine that it is collected from dhobi mati (a special type of soil). But this plant salts, which is difficult to separate from the kshara part.

C) Purification – Sarjika kshar is added with water and filtered for 5-6 times and heated till complete water evaporates. Thus it is purified.

D) Qualities

Quality	Piercive, hot, lightness, dryness, liquefying
Action	Improves digestive power, brings about burning sensation.

Note: Sarjika and Yava Kshara both mitigate Kapha, Constipation, Piles, Spleen disorder and semen. Care should be taken while administering kshara to men of reproductive age as kshara decreases quality and quantity of semen.

3) TANKAN KSHARA (BORAX) $Na_2B_4O_7.10H_2O$

A) Synonyms: Tankana, Tanka, Dravaka, Rangada, Soubhagya, shweta kshara, Kshara raja, Loha shodhana.

B) Introduction: Borax is obtained from the banks of ponds of Tibet, Nepal and Iran. Since it is alkaline in nature. It is called as tankana Kshara. Chemically it is Sodium pyroborate. It is found in the form of Tincal in Kashmir.

C) Shodhana: Administration of unpurified borax leads to vomiting and giddiness so its used at after purification. In purification process upon heating it in open air, the water content is evaporated and thus borax is purified.

D) Qualities

Taste	Pungent
Qualities	Dryness, Hot, Piercive
Action	Improve digestive power, strength, mitigates toxicity, good for heart, useful in kasa, shwasa. It improves hepatic function, relieves flatulence, cleanses wound.
Effect on dosha	Mitigates kapha, Vata and Vata Kapha disorders and stimulate pitta.
Effect on metals	Useful in purification of gold and silver.

4) APAMARGE KSHARA

A) Synonyms: Apamarga kshara, Mayura Kshara, Kharamanjarika Kshara, Kani Kshara.

B) Qualities

Quality – Piercive

Action – Mitigates shwasa, Gulma, Shoola. In case of deafness it is used in the form of taila.

5) ARKA KSHARA

A) Synonyms: Arka Kshara, Ravi kshara, Bhaskar Kshara, Mitra Kshara.

B) Qualities: It is piercive, useful in gulma, Spleen disorder, Shwasa and kasa. It also act as digestive.

6) TILA KSHARA

A) Synonyms: Tila kshara, Tila bhuti, Homadhanyabhuti, Pavitraksharaka

B) Qualities: It is piercive, relieves dysuria, Renal calculi, Spleen disorders and wounds.

7) SNUHI KSHARA

A) Synonyms: Snuhi kshara, Snuk kshara, Vajra kshara, Sehunda kshara

B) Qualities: It is piercive, relieves all types of Udara, Gulma, Improve digestive power, Oedema, Visuchika, Indigestion, Abdominal colic, Liver disorders and shwasa.

8) PALASHA KSHARA

A) Synonyms: Palasha kshara, Kimshuka kshara, Parna kshara, Triparna kshara.

B) Qualities: It improves digestive power, relieves Gulma, Pleeha, useful in hepatic disorders, Dysuria and calculi.

9) CHINCHA KSHARA

A) Synonyms: Chinacha kshara, Amlika kshara, Chincha bhooti, Amlika bhsama, Tintideeka bhasma

B) Qualities: Relieves indigestion, Gulma, Abdominal colic pain and dysuria and calculi.

Kshara dosage and shelf life[8]

Two to eight gunja (250- 100 mgs) is the general dosage for all types of kshara. Kshara obtained in powder form will have shelf life of 5 years.

ANALYTICAL PARAMETERS OF KSHARA[9]

1. Organoleptic Characters

Colour : Usually white/light grey.

Odour : Pleasant.

Touch : Soft.

Taste : Salty

2. pH

Defined as the common logarithm of the reciprocal of the hydrogen ion concentration expressed in g per liter. pH value fundamentally represents the value of hydrogen ion activity in solutions, i.e to know whether the solution is acid or base. It can be determined potentiometrically by means of the glass electrode, a reference electrode and a pH meter either of the digital or analogue type.

3. Loss on drying at 105

It is widely used test method to determine the moisture content of a sample, although occasionally it may refer to the loss of any volatile matter from the sample. Method: One gram of sample is taken in a Silica crucible and accurately weighed, heated on electric air oven up to 1050C for 3 hrs. Again weighed, the difference in weight was calculated.

4. Determination of Total Ash

The total ash method is designed to measure the total amount of material remaining after ignition. This includes both "physiological ash", which is derived from the plant tissue itself, and "non-physiological" ash, which is the residue of the extraneous matter (e.g. sand and soil) adhering to the plant surface.

Method: Incinerate about 2 to 3 g accurately weighed, of the ground drug in a tared platinum or silica dish at a temperature not exceeding 450c until free from carbon, cool and weigh. If a carbon free ash cannot be obtained in this way, exhaust the charred mass with hot water, collect the residue on an ash less filter paper, incinerate the residue and filter, add the filtrate, evaporate to dryness, and ignite at a temperature not exceeding 450. Calculate the percentage of ash with reference to the air- dried drug.

5. Determination of Acid Insoluble Ash

Acid-Insoluble ash is the residue obtained after boiling the total ash with dilute HCl, and igniting the remaining insoluble matter. This measures the amount of silica present, especially as sand and siliceous earth.

Method: To the crucible containing total ash, add 25 ml of dilute hydrochloric acid. Collect the insoluble matter on an ashless filter paper (Whatman 41) and wash with hot water until the filtrate is neutral. Transfer the filter paper containing the insoluble matter to the original crucible, dry on a hot-plate and ignite to constant weight. Allow the residue to cool in a suitable desiccator for 30 minutes and weigh without delay. Calculate the content of acid-insoluble ash with reference to the air-dried drug.

6. Determination of Water soluble ash

Water soluble ash is the difference in weight between the total ash and the residue after treatment of the total ash with water. It is a good indicator of either previous extraction of water soluble salts in the drug or incorrect preparation.

Method: Boil the ash for 5 minutes with 25 ml of water; collect insoluble matter in a Gooch crucible or on an ashless filter paper, wash with hot water, and ignite for 15 minutes at a temperature not exceeding 450. Subtract the weight of the insoluble matter from the weight of the ash; the difference in weight represents the water-soluble ash. Calculate the percentage of water- soluble ash with reference to the air-dried drug.

7. Water & Alcohol soluble extractive

It plays an important role in evaluation of crude drugs. Less extractive value indicates addition of exhausted material, adulteration or incorrect process during drying, or storage or formulating.

Alcohol Soluble Extractive: Macerate 5 g of the air dried drug, coarsely powdered, with 100 ml of Alcohol of the specified strength in a closed flask for twenty- four hours, shaking frequently during six hours and allowing to stand for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml of the filtrate to dryness in a tared flat bottomed shallow dish, and dry at 105º, to constant weight and weigh. Calculate the percentage of alcohol-soluble extractive with reference to the air-dried drug. **Water Soluble Extractive:** Proceed as directed for the determination of Alcohol-soluble extractive, using chloroform water instead of ethanol.

8. Total alkalis

Estimate the total alkalis as carbonate in the Kshara by titrating a known volume of the aqueous solution prepared for determination of pH, with N/25 hydrochloric acid using pH meter to an end point pH of 3.6. Calculate percentage of total alkali as carbonate using the titre value.

9. Microbial limit test

Limit test is defined as quantitative or semi-quantitative test designed to identify and control small quantities of impurity which is likely to be present in the substance. Limit test is generally carried out to determine the inorganic impurities present in the compound Permissible limits of heavy metals.

Parameters	Permissible limits
Staphylococcus aureus	Absent
Salmonella	Absent
Pseudomonas aeruginosa	Absent
Escherichia coli	Absent
Total microbial plate count	10^5/g
Total yeast and mould	10^5/g

10. Limit test

Limit test is defined as quantitative or semi-quantitative test designed to identify and control small quantities of impurity which is likely to be present in the substance. Limit test is

generally carried out to determine the inorganic impurities present in the compound Permissible limits of heavy metals.

Heavy metal contents	Permissible limits
Lead	10 ppm
Arsenic	3 ppm
Cadmium	0.3 ppm
Mercury	1 ppm

11. Determination of Na & K by flame photometer

A traditional & simple method for determining Na & K involves the technique of Flame photometry. Prinicple: An alkali drawn into a non-luminous flame will ionise, absorb energy from the flame and then emit light of a characteristic wavelength as the excited atoms decay to the unexcited ground state. The intensity of emission is proportional to the concentration of the element in the solution.

A photocell detects the emitted light and converts it to a voltage, which can be recorded. Since Na & K emit light of different wavelength by using appropriate coloured filters the emission due to Na & K can be specifically measured in the same sample. One drawback of Flame photometer is that they respond linearly to ion concentration over a rather narrow concentration range, so suitable dilutions usually have to be prepared.

Method: Prepare separate stock solution of sodium / potassium (500 mEq) by dissolving 2.9230 g sodium chloride / 3.7280 g potassium chloride in 100 ml triple distilled water. Prepare separate working standard solutions containing 0.5, 1.0, 2.0, 4.0 and 5.0 mEq of sodium/potassium from the respective standard stock solutions. Using flame photometer with appropriate filters, calibrate the standard solutions and prepare separate calibration plots respectively for sodium/potassium.

Take 0.1 g of Kshara add 15 ml of triple distilled water in 50 ml of volumetric flask and shake vigorously and make the volume up to the mark. Filter the solution and choosing sodium and potassium filter, calculate the content of the sodium/ potassium respectively in the coated material of Kshara by interpolation from the calibration plot.

CONCLUSION

Kshara are the substances obtained from the ashes of drugs of animals, minerals and plant origin, where alkaline portion is extracted from the ashes of these substances. Kshara kalpana

is important role in pharmaceutical science, so method of preparation of kshara and its analytical standardization is very important. It is clear that analytical parameters are last step in standardization of pharmaceutical preparation, but standardization of raw material by phamacognostical methods and following the standard methods of preparation are the prior steps which play an important role in the quality and quality of the end product. The therapeutic effect depends on the quality of the drug administered. To obtain the expected outcome after administration on particular disease, especially a combined drug formula all ingredients should be present in it, this can be confirmed with the help of these analytical parameters.

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