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ELEMENTAL ANALYSIS & COMPARISON OF VARIOUS SALTS BY XRF METHOD AND PREPARATION OF VIDA LAVANBY MODIFIED METHOD & ITS ANALYSIS.

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ABSTRACT

The Panchalavan group, which consists of five types of salt, is named differently across various texts. During medieval times, for medicinal purposes, people from different regions used salts known by local names. Consequently, the same salt might have had different names in different areas. This led to variations in the medicinal preparations used across regions, even when the same medicine was intended. As a result, the clinical outcomes of these medicines could differ from the expected results based on the original formulation, leading to confusion about the true identity and classification of the salts within the Panchalavan group. This study presents a comprehensive elemental analysis of commercially available salts using the X-Ray Fluorescence (XRF) method. The research further explores the synthesis of Vida Lavan, a traditional Ayurvedic salt, employing a modified technique. Due to the unavailability and questionable authenticity of Romak Lavan, Saindhav Lavan was substituted in the preparation of Vida Lavan according to a reference of abhav varga in Yogratnakar. The XRF analysis revealed significant disparities in the elemental composition and quantities of salts currently on the market compared to previous studies. Additionally, a marked difference was observed between Vida Lavan procured from the market and that synthesised using the modified method. This suggests variations in manufacturing processes and highlights the need for standardised protocols to ensure consistency and authenticity in Ayurvedic salt preparations.

The findings underscore the importance of rigorous quality control and accurate labelling to preserve the integrity of traditional medicines and protect consumer health.

KEYWORDS: Ayurvedic salts, lavan, saindhav salt, vida lavan, romak lavan, sauvarchal lavan.

INTRODUCTION

Ayurveda is a traditional system of medicine that uses various herbal and mineral substances for theprevention and treatment of various diseases. Among the mineral substances, salts are widely used for their therapeutic properties. There are five types of salts mentioned in Ayurvedic texts, namely Saindhava Lavana, Sauvarchala Lavana, Vida Lavana, Samudra Lavana and Audbhida Lavana.[1]

Each salt has a different chemical composition, taste, potency and effect on the body. Vida Lavana is one of the most controversial salts, as there are different opinions regarding its identity, source and preparation method.[2]

The aim of this research paper was to analyse the elemental composition of all the Ayurvedic medicinal salts available in the market using X-ray fluorescence (XRF) technique and to comparethem with the textual references and research paper references.

XRF is a non-destructive and rapid method for the determination of major, minor and trace elements in various samples.[3]

In addition, this paper also reports the preparation and analysis of Vida Lavana by using 80 tola Saindhava Lavana and 10 tola dry Amalaki, instead of the reference of Rasatarangini book 14th chapter shlok number 150,151,152 6 which mentions 80 tola Romaka Lavana and 10 tola dry Amalaki.[4] The reason for this modification is to avoid the use of Romaka Lavana, which is a type of earthen salt that may contain impurities and toxic elements and also its identity and authenticity was questionable. The prepared Vida Lavana was also analysed by XRF and compared with the other salts and the textual description.

Description of various Lavans in Ayurvedic texts.

Lavana, in general term is salt. lt is widely used both in food and medicine and also is an essential element in the diet of not only human beings but of animals too and even of many

plants.

The names of five varieties of lavana included in Pancha Lavana group vary from text to text. In the Mediaeval time for medicinal purposes, people of various regions were using lavanas according to their local name. So the name of one lavana was different in one region from another. For a result in medicinal preparation, the people were using different lavanas in different regions for the same medicine. Because of the result of clinical application of that medicine, comparison differs from the result of the original compound, in a particular disease.[11]

Lavana Nirukti

According to Shabdakalpadruma, Lavana Nirukti is

"Lunati Iti Lavanam", means which is having Chedana property is known as Lavana.

Lakshana

"Lunaati Jaayamiti"

That which does Chedana is called Lavana.[12]

Out of 29 texts, following 12 texts have been mentioned - Saindhava, Sauvarchala, Vida, Samudraand Audbhida as Panchalavana.[11]

1. Charaka
2. Vagbhatt
3. Chakradatta
4. Gadanigraha
5. Anandakanda
6. Rasendra Chintamani
7. Rasa Kamadhenu
8. Vangesen
9. Bhaishajya Ratnavali
10. Yogaratnakara
11. Sidhaprayoga latika
12. Nava Paribhasha

Following are the 12 texts which have described the same four lavanas but Audbhida is replaced by Romaka.[11]

1. Sushruta

2. Sarangadhar
3. Bhavaprakash
4. Rasaratna Samuchchaya
5. Goraksha Samhita
6. Basendrasarasangrah
7. Rasatarangini
8. Rasendra Purana
9. Rasa Jala Nidhi
10. Sidhadheshajyamanimala
11. Vaidyaratna
12. Vaidyaka Paribhasha Pradipa

Based on its Origin[13]

Prakrita - Eg: Saindhava Lavana, Samudra Lavana,Romaka Lavana. Kritrima - Eg: Vida Lavana, Sauvarchala Lavana.

Based on numbers[13]

Ekalavana - Saindhava Lavana

Dwi Lavana - Saindhava, Sauvarchana Lavana.

Trilavana Lavana- Vida Lavana,Saindhava Lavana, Sauvarchana Chaturlavana - Saindhava, Sauvarchana, Vida, Samudra Lavana.

Pancha Lavana - Saindhava, Sauvarchana, Vida, Samudra, Audbhida Lavana.

Shad Lavana -Saindhava, Sauvarchana, Vida, Samudra, Romaka, Chullika Lavana.

Panchadasha Lavana - Charaka expained 15 Lavanas in Vimana Stana.[13]

1. Saindhava Lavana
2. Sauvarchana Lavana
3. Kala Lavana
4. Vida Lavana
5. Pakya Lavana
6. Anúpa Lavana
7. Kupya Lavana
8. Valuka Lavana 9.Maulaka Lavana
10. Samudra Lavana

11. Romaka Lavana
12. Audbhida Lavana
13. Oushara Lavana
14. Pateyaka Lavana
15. Pamsuja Lavana

Discussion of Audbhida and Romak lavan.

a) In Sushrut Samhita the statement regarding qualities of lavanas go like this

"सैन्धव- सामुद्रविडसौवर्चलरोमकौद्भिप्रभृतीनि लवणानि यथोत्तरमुष्णानि वातहराणि कफपित्तकराणि कटुपाकीनि यथापूर्वं स्निग्धानि स्वादुनि सृष्टमूत्रपुरीषाणि चेति"
(Su.Su- 46/314.)

This reference suggests that Audbhida, Romaka, Sauvarchala, Vida, Samudra and Saindhava are superior to each previous one, in terms of their Vata alleviating and Snigdha, Madhura etc properties. So Romaka is some what superior to that of Audbhida. Hence Audbhida can be includedas Romaka.

Thus, the group of Panchalavana contains.

Saindhava, Sauvarchala, Vida, Samudra and Romaka.[11]

औद्भिदं पांशुलवणरोमकं वासुकं वासु (D.N. -Satapuspdivarga)
"रोमकमौद्भिदमुक्तं वसुकं वसु पांशुलवणमुसरजम् (R.N.-Pipalyadi varga)

This reference states that Romaka is synonymous to Audbhida.

The qualities of Romaka and Audbhida described in different texts are almost similar. After goingthrough these references we conclude that Audbhida can be replaced by Romaka. Rasa Hrudaya Tantra states six types of lavanas viz. Sauvarchala, Saindhava, Chullika, Samudra, Romaka and Vida.[11]

SALT 1 -SAINDHAV LAVAN

Among two varieties of Saindhava Lavana the white variety (sweta) is considered for medicinal usage. The term is applied to lavana (salt), which is regarded as the best of salts. The source of theSaindhava lavana is from underground mines as well as banks of the rivers. Saindhava comes under lavana varga.

Saindhava lavana is a mineral which is obtained from punjab mines. According to charaka, saindhava is considered best amongst all the salts for internal use.

According to Ayurveda by the name of lavana, Saindhava lavana is advised (Sa.S.M. 6/22). Saindhava lavana is one of the ingredient in many Ayurvedic dosage forms which are used internally as well as externally.[11]

Synonyms

1. Saindhava, Sindhu, Sindhuttha, Nadeya, Vimala, Vara, Shiva, Shitashiva, Shudha, Sindhuja, Shilatmaka, Manimantha, Dhauteya & Pattuttama (K.N.-dhatu varga/96- 97)
2. Shivatmaja & Pathya(A.K.Kr.K.V./334)
3. Sarasa (S.N. - satapuspaduvarga/301)[11]

English Name: rock salt, Chloride of Sodium
Hindi - Sendha namak, sendhanona, lahauri namak.
Latin Name-Sodium chloridum
Marathi - Saindhav

Phamacological Properties.

a) Rasa - Madhura.
b) Virya - Sheeta.
c) Guna - Snigdha, laghu

Specific action - Chakshushya (promoter of eye sight), Hridya (Cardiac tonic), Vrisya (aphrodisiac) Ruchi (appetiser), elevator of all three dosas & Vivandhajit (cures constipation) Su.su.46/315 & A.K.Kr.K.V./335.

It cures aruchi, netra roga, vrana and vibandha and considered best among all the lavana dravyas. Itis commonly used as condiment and food preservative.[11]

Grahya lakshanas

The crystalline, irregular in shape and white in colour. When water is added to it, the chemical reaction results in production of heat and steam.

Properties

As such sudha is not directly used for medicinal purposes, as it is an irritant and produces heat. It is used as medicine in the converted form after reacting with water, which has a chemical formula Ca(OH)2 and called as slaked lime. It acts as krimighna, amlapittanashak,

udara and grahaniroganashak.

(a) सैन्धवं लवणं वृष्यं चक्षुष्य रूचिदीपनम्
त्रिदोषशमनं पूतं व्रर्दोषववबन्धम्जत् ॥
सैन्धवं दविविधं ज्ञय श्वेतं रक्तममनत क्रमात् ।
रसवीर्ययबववपाकेषु गुणाढ्य नूतनम् शिवम् ॥
(Raj. Nighantu.. 89 / 90)

b) सैन्धवं लवणं स्वादु दीपनं पाचनं लघु ।
स्निग्धं रूच्यं हिमं वृष्यं सूक्ष्मं त्रिदोषहृत् ॥
(Bhavprakash Nighantu. Haritakiyaadi varga)

Varieties

Two varieties - 1 Red 2.'White

(A.K.Kr.K.V./336)

Physical properties

1. Appearance- Stony pieces
2. Colour- Whitish red
3. Consistency- Hard
4. Dissolved in water.(Selected sample, %w/w, dry basis)

Chemical Properties

5. Sodium Chloride NaCl - 97.68 % w/w
6. Sodium Bicarbonate NaHco, --0.07%w/w
7. Insoluble matter -- 0.031 % w/w

In addition to above, Saindhava lavana also contains in minor quantities Magnesium chloride, Calcium chloride and Calcium sulphate.[11]

Rock salt is the common name for the mineral "halite". Its chemical formula is NaCl. Actually, rock salt is not (potassium sulfate) K, 50, it is NaCl. It can have impurities of gypsum (CaSO,) and sylvite (KCI) but it is very rare to find potassium sulfate as a mineral, although, occasionally, polyhalite (K, Ca, Mg(SO 2H,O) is found associated with rock salt deposits. The origin of rock salt comes from the bed sea that evaporated million years ago. It left behind crystallised deposits of this pure, therapeutic salt form which contains all the elements found in our human body. Rock salt is possibly the purest form of salt, which is free from environmental pollutants, chemical components and does not require a refining process.

It contains pure minerals such as Calcium, Iron, Zinc, Potassium, Magnesium, Copper and all the other 84 minerals. Its benefits are best experienced when used in its natural state. Rock salt is used externally and internally and is easily absorbed as its composition of minerals is similar to what we contain in our bodies.[14]

Modern chemistry of Rock salt and common salt.[14]

Rock salt: Na 39.00%, K 0,12%, Cl 60.27%

Common salt: Na 39.34 %, Mg 0.03 %, Ca 0.08 %, Cl 60.66%, SO4 0.27%

SALT 2: ROMAKA LAVAN

As it is mentioned in the Panchalavana sequence, Romaka, Audvida etc. according to many of thetexts, Romaka lavana is the synonym of Audvida lavana.

Acharya Chakrapani (commentator of Su.S.) mentioned

"रोमक रुमानदीभवं, शाकम्भिरदेवीस्थलोपलक्षीतदेशसम्भवं शाम्भरिवलणमित्यन्ये ‘’

Acharya Hemadri (commentator of A.H.) considered "रोमक शाकम्भिरदेशेत्थमम्". Nischalakara (Ratnaprava Tika on Chakradatta also mentioned that the original source of Romakalavana is Rumanadi (Ruma river).

At the same time he also advises that in the non availability of Romaka lavana, which is collectedfrom Ruma nadi, Sambhara lavana can be taken.‘रोमकं रुमानदीजं तद्भावेशाम्भिरलवणिमत्याहु".

Present day in the trade, the Romaka lavana is available by the name of Sambhar namak.[11]

Synonyms

1. Gadakhya, Roma lavana, Roma & Sakambharibhava (M.N. - Sunthyadi varga/64)
2. Gadadi lavana, Shubhra, Pruthivija,Gadadesaja, Gadottha & Maharambha.(R.N.-pipalyadi varga/98)
3. Vastaka (K.N.-dhatuvarga/109)
4. Audbhida (R.N.-pipalyadi varga/106)

English- Sambhar Salt

Taste-Saline

Attributes-Tikshna (sharp), Vyavai(Which gets digested and metabolized after it has pervaded all over the body).Laghu (light), Avisyandi (which obstruct channels of Circulation

& Sukhma (subtle).

Vipaka-Katu (bitter).

Potency-Very hot

Action-Bhedi (purgative), Mutrala(diuretic), Rochana(appetiser), Dipana (digestive stimulant), Vataghna (elevator of vayu). [Su.su.-46/319, M.N.-p/125 (Todarananda)][11]

Physical Properties

1. Appearance- Circular crystals form
2. Colour-Whitish grey
3. Consistency- Hard
4. By dissolving nature in water.(Selected sample, %w/w, dry basis).

Chemical properties

5. Sodium Chloride NaCI- 97.11.%w/w
6. Total Sulphide Na,s - 0.060 %w/w
7. Sodium BicarbonateNaHCo,-0.049%w/w[11]

By observing all these factors Sambhar lavana is having approximately similar pharmacological and therapeutic values of Audbhida lavana. Hence Sambhar lavana can be considered in place of audbhida lavana for preparing Ayurvedic dosage forms which contains Panchalavana.[11]

SALT 3: SAMUDRA LAVAN

Samudra lavana comes from the sea. Depending upon the location of the sea, milled variation in thecomposition of Samudra lavana (sea salt) takes place. According to the commentary of Sarangadhara (gudartha dipika) "दक्षीणसामुद्रसमीपे भवं समुद्र लवणम्"

- Sea salt obtained from southern

part of India produces best quality. In the present study Samudra lavana sample obtained from Gujrat coastal area has been possessing following physiochemical characters.[11]

Synonyms

1. Samudraka Samudra, Samudra lavana, Shiva, Vashira, Sagarottha, Shishira and Lavanabdhija(R.N.-pipalyadi varga/100).

2. Varishambhuta, Akshiva & Asura (M,N.-Sunthyadi varga/64)
3. Sagaraja and Lavanadadhisambhava (R.N.-pipalyadi varga/100).[11]

Description

English-. Sea Salt

Latin Name-. Sodi muris

Taste-. Saline

Attributes- Snigdha (Unctous), Ruksha

(dryness), Natisara (It does not posses strong laxative effect), Guru (heavy) & Avidahi (Which doesnot causes burning sensation).

Vipaka-Madhura (sweet)

Potency-Natyusna (Not very hot)

Action-Dipana (Digestive stimulant)

Specific action-Bhedana (Purgative)

Alleviates vata, aggravates Kapha, It dose not aggravate Pitta in excess.[Su.su.-46/316 & M.N.-Sunthyadi varga/65 & A.S.- Todarananda][11]

Physical Properties

1. Appearance- Cubical crystals
2. Colour- Whitish gray
3. Consistency- Hard
4. By dissolving nature in water.(Selected sample, %w/w, dry basis).

Chemical properties

5. Sodium Chloride NaCI- 91.39 %w/w
6. Total Sulphide Na,S -0.121 %w/w

Apart from these Samudra lavana also contains in low quantities like Calcium sulphate, Magnesium sulphate, Magnesium chloride etc. By observing above mentioned factors it can be revealed that Samudra lavan is crude form of Sea salt.[11]

SALT 4: SAUVARCHALA LAVAN

As it is mentioned that Sauvarchal lavana will have black colour. At present day in market it is available by the name of Kala namak.

As per latest literature of Ayurveda, Sauvarchal lavana is a substance which is prepared by mixing Sea salt and Sarji kshara etc. There is evidence too present for preparing Sauvarchala lavan by adding different other materials. Many of times Sauvarchala lavana contains Sodium choride and not of Sodium carbonate.[11]

Synonyms

Ruchaka; Tilaka, Hridyagandhaka, Akshya, Krishnalavana, Ruchya and Kodravika (A.K.Kr.K.V./342)

Sugandhi, Saugandhika and jarana (K.N.-dhatuvarga/99)[11]

English Name-Sochal Salt, Black Salt

Latin Name-. Unaqua Sodium Chloride

Taste-Saltish

Attributes- Laghu (light), Visada (non-slirny), and Sukshma (subtle)

Sneha (Unctuous)

Potency-Hot

Action-Rochana(excellent appetizer),Dipana(carminative), Pachana (Digestive stimulant), Vatanunnatipittalam (it alliviates vayu but does not aggravate pitta in excess).

Therapeutic usage-Cures vivandha (constipation), Anaha (flatulence) and Sula (colic pain). It cleanses Udgara (ruction).

Varieties

Two Varities -1. Sagandha--having smell (Artificial source).

2. Nirgandha-- no smell (Mineral source) (Ch.S.Su.-27/303, Sa.S.-Adhamalla Tika)

Physical Properties

1. Appearance- Big masses
2. Colour- Blackish brown
3. Consistency- Hard
4. By dissolving in water produces H,S smell.

Chemical Properties

5. Sodium Chloride NaCI - 97.82 % w/w
6. Total Sulphide-0.918 % w/w
7. Iron- 0.030 % w/w
8. In soluble matter- 0.07 % w/w[11]

By observing these features Kala namak can be considered as Sauvrchal lavana which is having thesimilar properties mentioned for the Sauvarchal lavana.[11]

SALT 5: VIDA LAVAN

Synonyms

1. Khanda, Krutaka, Kshyara, Asura, Supaka,Dhurta & Krutrimaka (R.N.-pipalyadi varga/96)
2. Vidgandha, Pakya, Ghatikalavana, Dravida(K.N.-dhatuvarga/102)

Description

Taste-Saline

Attributes-Laghu (lihgt), Tikshna (sharp), Ruksh (dryness), Vyavai(Which gets digested and metabolized after it has pervaded all over the body.)

Potency-Hot

Action-Dipana (carminative), Ruchya(appetiser) Eliminates Kaphaand Vayu through upward & downward tract respectively.

Therapeutic usage -Cures vistambhasula (Colic pain caused by the impairment of the peristaltic movement of the colon), Hridgaurava (heaviness in the cardiac region), Aruchi (anorexia), Anaha(flatulence),and Shula (colic pain).[11]

Physical Properties

1. Appearance- Small pieces
2. Colour- Greyish white
3. Consistency- Hard
4. By dissolving nature in water some quantities of insoluble matter are also found.(Selected sample, %w/w, dry basis).

Chemical Properties

5. Sodium Chloride Nacl-93.77 %w/w
6. Total Sulphide Na, S-0.121 %w/W
7. Iron Fe-0.0089 %w/w[11]

Vida lavan is supposed to get prepared by mixing different substances. At present day in trade Vida lavan is available by the name of Vid namak "विडं कृत्रिमम्" (Adhamalla) and several

procedures are described in the text for its preparation. In the same way different procedures are described for manufacturing Chullika lavana (R.J.NCha-3- P215). As both are artificial ones, having the same qualities. Chullika can be included in Vida lavana This inclusion will not disturb the group of Pancha Lavana stated earlier. According to Rasarnava & R.R. Rudhivadi Khanda, Panchalavana includes: Samudra, Saindhava, Chullika, Sauvarchala and kacha lavan. Chullika lavana can be included in Vida lavana. Adhamalla has written that Kachalavan is sub type of Sauvarchala. Hence Kacha can be included in Sauvarchala. Again also this inclusion will not disturb the group of five lavanas stated earlier.

According to R. Chudamani and Vaidya Chintamani Panchalavana includes: Samudra, Saindava,Kacha, Vida and Sauvarchala. Here Kacha can be included in Sauvarchala which is analogous to lavana chatuska of Sarangadhara[11]

SALT - 6: Synthesised vida lavan according to modified method

MATERIALS AND METHODS

PREPARATION OF VIDA LAVAN

अशीतितोलकमितं लवणं रोमकाभिधम् ।
चूर्णमामलकोद्भूतं दशतोलकसम्मितम् ॥१५०॥
मृल्लिप्तहण्डिकायां तु विन्यस्य प्रखराग्निना ।
यामद्वयं विपाच्याथ स्वाङ्गशीतमथोद्धरेत्॥१५१॥
विडाभिधं तु लवणं रसतन्त्रविधानवित् ।
अनुभूतोऽपि सुगमः प्रकारोऽयं प्रकाशितः ॥१५२ ॥
-Rasatarangini 14/150-152[7]

Translation and meaning of the above shlok: 80 tola romak lavan and 10 tola dry amalaki should be taken and triturated together. It should be then taken in an earthen vessel and covered and sealed with wet cloth sealed with multani clay paste and dried well in the sun and then is subjected to tivraagni for 6 hrs (2 yaam). It is then to be cooled down on its own at room temperature and the vida lavan that will be formed inside is obtained.

METHOD: Vida lavan was synthesised by taking 1/5th of the above mentioned proportion.
Amalaki churna: 2 tola i.e. 24 gm,
Saindhav lavan: 16 tola i.e. 192 gm,
While procurement of salts in the market the identity of romak /sambhar lavan couldn't be

established from pure sources and by XRF methods, so instead of romak lavan, it's abhav / prantinidhi dravya was taken as Saindhav lavan according to a reference in Yogratnakar -Abhaavarga

रुचकाभावतो दद्याल्लवणं पांसुपूर्वकम्। लवणानामभावे च सैAवं तत्र दीयते ॥१२॥[15]

-(Yogratnakar -Abhaavarga)

XRF (X-ray fluorescence) is a non-destructive analytical technique used to determine the elemental composition of materials. XRF analyzers determine the chemistry of a sample by measuring the fluorescent (or secondary) X-ray emitted from a sample when it is excited by a primary X-ray source. Each of the elements present in a sample produces a set of characteristic fluorescent X-rays ("a fingerprint") that is unique for that specific element, which is why XRF spectroscopy is an excellent technology for qualitative and quantitative analysis of material composition.[16]

XRF analysis was done of all the market brought salts. After synthesising vida lavan according to the modified metho by using saindhav lavan, the modified lavan was analysed by XRF technique.Elemental comparison of all the lavans was done.

Saindhav Lavan and Amalaki Churna was Weighed and Mixed Together In A Mud Pot.

The mud pot was closed with lid and sealed well with 7 layers of kapadmitti (layered sealing of cloth and multani clay)and dried well.

The sealed and dried potwas subjected to tivra agni for 6 hrs.

Synthesised Vida lavan.

RESULTS AND DISCUSSION

Results

Table of elemental analysis by XRF of all the 6 lavans.

	Composition	Salt 1: Saindhav lavan	Salt 2: Romak Lavan	Salt 3: Samudra Lavan	Salt 4: Sauvarchal lavan	Salt 5: Vida lavan (market)	Salt 6: Vida lavan (synthesised)
1	Cl	80.4	79.2	80.4	65.8	52.6	81.3
2	SO3	5.9	7.02	7.27	25.4	1.48	6.66
3	CaO	4.41	4.2	4.92	0.517	4.28	4.66
4	SiO2	4.17		3.14	3.58	5.23	2.49
5	Al203	4.01	3.22	4.08	2.82	3.58	3.79
6	K20	0.75	3.96		1.36	31.8	0.861
7	Fe2O3	0.24	0.346	0.0877	0.452	0.889	0.0944
8	TiO2	0.0447	0.0413	0.0434	0.0389	0.0598	
9	Br	0.0188	0.0251	0.0159	0.0207	0.0069	0.0151
10	NiO	0.0114					0.0384
11	SrO	0.01	0.0163			0.0251	0.0335
12	CuO	0.0047	0.0063	0.0054	0.005	0.0037	0.0071
13	ZnO	0.0023	0.0047		0.0027	0.0132	0.0001
14	SnO2		0.0175		0.019		0.0239
15	MnO		0.0103			0.0165	
16	PbO		0.0023			0.0008	
17	BaO					0.0225	
18	ZrO2					0.0128	
19	As203					0.001	

DISCUSSION

Elemental analysis of various salts according to previous researches[11]

Salt 1- Saindhav Lavan

Chemical analysis of Saindhav salt from previous researches

Sodium Chloride NaCl - 97.68 % w/w

Sodium Bicarbonate NaHco. --0.O7 % w/w

lnsoluble matter -- 0.031 % w/w

Salt 2 - Romak Lavan

Chemical analysis of Romak salt from previous researches Sodium Chloride NaCl - 97.11

%w/w

Total Sulphide Na2S - 0.060 %w/w

Sodium Bicarbonate NaHCO3 - 0.049 % w/w

Salt 3 - Kaanch Lavan / samudra lavan

Chemical analysis of Samudra salt from previous researches

Sodium Chloride NaCl - 91.39 % w/w

Total Sulphide Na2S - 0.121 % w/w

Salt 4 - Black salt / Sauvarchal Lavan

Chemical analysis of Sauvarchal salt from previous researches

Sodium Chloride NaCl - 97.82 %w|w

Total Sulphide Na2S - 0.918 % w/w

lron: Fe -- 0.030 % w/w

Insoluble matter -- 0.07 % w/w

Salt 5 -Vida lavan from market

Chemical analysis of Vida salt from previous researches

Sodium Chloride Nacl =93.77 % w/w

Total Sulphide Na2S -0.121 % w/w

Iron Fe 0.0089 % w/w

SiO^2 was found in all salts except market brought romak lavan.

K2O was found in all salts except samudra lavan.

NiO was found in saindhav lavan and synthesised vida lavan.

SrO was not found in samudra and sauvarchal lavan.

BaO, ZrO2, As2O3 was found only in market brought vida lavan.

TiO2 was found in all lavan except the synthesised vida lavan

CONCLUSION

1. Theres is vast difference in the chemical composition found out through XRF technique in the salts available in the market now in the year 2022-2023 compared to the research papers doneon the various salts in 2005.
2. SiO^2 was found in all salts except market brought romak lavan.
3. K2O was found in all salts except samudra lavan.

4. NiO was found in saindhav lavan and synthesised vida lavan
5. SrO was not found in samudra and sauvarchal lavan.
6. BaO, ZrO2, As2O3 was found only in market brought vida lavan.
7. TiO2 was found in all lavan except the synthesised vida lavan
8. Identity and authenticity of romak lavan couldn't be established elementally compared to previous researches hence saindhav lavan was used in its place to synthesise vida lavan.
9. There was a considerable amount of difference both elementally and quantitatively in the market brought vida lavan and synthesised vida lavan.
10. Further detailed research should be done for each lavan as mentioned in the ayurvedic texts andits information should be made available in the The Ayurvedic Pharmacopoeia of India (API).

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2) Varsha Bullion & Elemental Analab, Kalbadevi, Mumbai.

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ABBREVIATIONS

Ch.S.Su. - Charak samhita Sutra sthan

Su.su.- Sushrrut samhita sutrasthan

R.J.N

K.N. -Kaiyadeva Nighantu

A.H. - Ashtang Hriday

B.P.- Bhavprakash

D.N. - Dhanvantari Nighantu

M.N.- Madhav Nidan

S.N.

R. N.- Raj Nighantu

A.S. - Ashtang sangrah

Sa.S.-Adhamalla Tika

Sa.S.M- Sharangdhar samhita Madhyam khand