INTRODUCTION

Salt is the mineral which generally contain NaCl is internal part of the daily food. It is the main constitue of the body fluids which helps in maintaining many physiological processes in the body. Excess use of salt results is conditions like edema, hypertension due to increase in the volume of the fluid intra or extracellular. Nausea, vomiting, headache, confusion, loss of energy, fatigue, restlessness, irritability, muscle weakness, spasms, cramps, seizures...
and coma were caused due to decrease in the percentage of the Na.²
Ayurveda denote the salt under the umbrella of Lavana. Lavana or salt is one taste among the six tastes. Lavana is used since medieval period as a food seasoning, preservation and agriculture practices. These lavana were used under the different local names which are obtained from their local source. Ancient scholars mentioned six types of different lavana depending upon their source, content. Saindhava (Rock Salt), Samudraj (Sea Salt), Bid Lavana (Black colored salt), Sauvarcha land Romak.³ They mainly contain Na, Cl with slight variation in other elements like K, Fe⁴.
Saindhava, samudra, Sauvarcha land romaklavana were naturally occurred. Bid, Sauvarchallavana was the artificially prepared salt. Some scholars quoted Chullikalavana as Bid Lavana.⁵ But Chullika Lavana is mainly ammonium chloride obtained from excreta of animals and ash of some plants like Karir and pilil⁶. Bid Lavana is artificially prepared from following methods as mentioned in table no.1

Table 1: Different methods of preparation of Bid Lavana

<table>
<thead>
<tr>
<th>Method No.1</th>
<th>Strong heat for 6hrs is applied to the 8:1 proportion of RomakLavana and Amalaki powder.⁷</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method No.2</td>
<td>Strong heat for 4 to 5 hrs is applied to the 44.8:1 proportion of RomakLavana and Amalaki powder for 6 hrs.⁸</td>
</tr>
<tr>
<td>Method No.3</td>
<td>Strong heat till melting of 82:1:1:1 proportion of Rock salt, Sajjikshar, powder of Haritaki and Amalaki is applied.⁹</td>
</tr>
</tbody>
</table>

As per ancient text bid lavana is black in color and having Ushna (hot), Tikshna, Laghu (Light), sukshma (Fine) properties. Bidlavan is good appetizer; improve the taste sensation. It helps in helps in normalizing the motion of Kapha, Vata and Mala in the body.⁹
So present work is carried out to study the effect of procedure on the raw material used on different physicochemical parameters by using present sophisticated instruments like flame photometry, FTIR, TGA-DTA.

Material and Methods
Raw material like Rock Salt, Sajjikshar, powder of haritaki (Terminalia Chebula), powder of Amalki (Embelica Officinalis) were procured from raw drug store, Pune.

Preparation of Bid Lavana:
The ingredients as mentioned in table no. 1 were mixed properly and kept in the small mud pot. Pot is closed with the plate which is sealed by using multani mud smeared cloth and kept for drying in shades. Then heat is applied by using puta method. The details of preparation were mentioned in table no. 2.
Preparation of Bidlavana by just mixing: Powders of Haritaki and Amalaki were burnt to black ash. Then rock salt and sajjikshar was added to it and mixed properly.

Rock salt, Bidlavana prepared by puta and Simple mixing methods were analyzed by using following tests.

**Loss on drying**[^10]

Accurately weighed 10 gm of the sample was taken and dried in oven at 105°C, till constant weight is observed. The loss on drying was calculated by using difference in the weight of sample before and after drying and expressed as %w/w.

**Determination of Total Ash**[^11]

About 2 g accurately weighed sample was incinerated in silica dish at a temperature not exceeding 450°C until free from carbon. After cooling weight of ash was calculated to find percentage of ash as % w/w with reference to the original weight taken of the sample.

**Determination of Acid Insoluble Ash**[^12]

25 ml of dilute hydrochloric acid and ash was taken in the crucible and mixed properly. Collected insoluble matter on an ashless filter paper (Whatman 41) was washed with hot water until the filtrate is neutral. Filter paper, containing the insoluble matter, was transferred to the original crucible, dried on a hot-plate and ignites to constant weight. The residue was allowed to cool in a suitable apparatus for 30 minutes and weighed without delay. The content of acid-insoluble ash was calculated with reference to the air-dried drug.

**Determination of pH values**[^13]

The pH value of an aqueous liquid may be defined as the common logarithm of the reciprocal of the hydrogen ion concentration expressed in g per liter. The pH values of sample were calculated by using Digital pH meter with magnetic stirrer EQ-614A.

**Determination of XRD**

XRD patterns of the solid samples were recorded on Rigaku cd-max II vc model X-ray diffractometer using cuka radiation filtered by a nickel foil over the range of diffraction 3-80°. The wavelength of the radiation was 1.5405Å.

**Determination of FTIR**

The sample was mixed with KBr procured from Merck Chemicals. Thin sample pellets were prepared by pressing with the hydraulic Pellet. Pellets were analyzed by using Perkin-Elmer FTIR spectrophotometer in the range of 4000-400 cm⁻¹.

### Table 2: Details of Preparation of the Bidlavana

<table>
<thead>
<tr>
<th>Batch</th>
<th>Quantity of Rock Salt</th>
<th>Quantity of Sajjikshar</th>
<th>Quantity of Haritaki powder</th>
<th>Quantity of Amalaki powder</th>
<th>Number and weight of Cowdung Cakes used</th>
<th>Final Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch A</td>
<td>246gms</td>
<td>3 gms</td>
<td>3 gms</td>
<td>3 gms</td>
<td>35 in no. and 14.150 kg wt.</td>
<td>201 gms</td>
</tr>
<tr>
<td>Batch B</td>
<td>246gms</td>
<td>3 gms</td>
<td>3 gms</td>
<td>3 gms</td>
<td>35 in no. and 13.100 kg wt.</td>
<td>198gms</td>
</tr>
<tr>
<td>Batch c</td>
<td>246gms</td>
<td>3 gms</td>
<td>3 gms</td>
<td>3 gms</td>
<td>38 in no. and 14kg wt.</td>
<td>195gms</td>
</tr>
</tbody>
</table>

[^10]: Loss on drying
[^11]: Determination of Total Ash
[^12]: Determination of Acid Insoluble Ash
[^13]: Determination of pH values
**RESULTS AND DISCUSSIONS**

*Bid lavana* is prepared by adding *sajjikshar* and powders of *Haritaki* and *Amalaki* and heat is applied in specific pattern by using ancient *puta* system. Application of heat in specific pattern helps in the expected reaction to happen in above mixtures. Mainly changes will takes place in the rock salt. Here three batches were prepared to ascertain the temperature pattern in ancient *puta* system. Maximum temperature recorded in the range of 860 to 890 °c. The temperature in the range of 750 to 810 remains for 30 to 40 minutes. Rock salt melts in the range of 800 -810 °c. The ingredients Na and cl from melted rock salt may react with K from *Sajjikshar* and other elements from herbal powders. The details of the temperature in the preparation of the *Bidlavana* are given in the graph no. 1.

**Graph 1: Temperature Pattern in the Preparation of *Bidlavana***

While in other batch *bid lavana* is heated with other ingredients till ash of other herbal powders were formed in open pan at the temperature in between 500-550 °c for 20-30 minutes also. Here *Bidlavana (S)* is prepared by above method. Both the samples of *Bidlavana* were subjected for the further analysis as given below.

The organoleptic parameters were given in table no. 3. White colored rock salt converts
into the blackish red colored crystals of \textit{Bidlavana}. After melting some ingredients from other mixtures react with NaCl of rock salt. Self cooling may helps in the formation of new stable compound in the forms of crystals.

**Table 3:** Organoleptic characteristics of Rock salt, \textit{Bidlavana} and \textit{Bidlavana(S)}

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rock Salt</th>
<th>\textit{Bidlavana}</th>
<th>\textit{Bidlavana(S)}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>White</td>
<td>Blackish Red</td>
<td>Grey</td>
</tr>
<tr>
<td>Odor</td>
<td>Not specific</td>
<td>Not specific</td>
<td>Not specific</td>
</tr>
<tr>
<td>Taste</td>
<td>Salty</td>
<td>Salty</td>
<td>Salty</td>
</tr>
<tr>
<td>Texture</td>
<td>Smooth</td>
<td>Smooth</td>
<td>Smooth,Fine</td>
</tr>
<tr>
<td>Sound</td>
<td>Not specific</td>
<td>Not specific</td>
<td>Not specific</td>
</tr>
</tbody>
</table>

The physic chemical parameters were given in the table no.4.

**Table 4:** Physicochemical Analysis of Rock Salt, \textit{Bidlavana}, \textit{Bidlavana(S)}

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rock Salt</th>
<th>\textit{Bidlavana}</th>
<th>\textit{Bidlavana (S)}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss on drying</td>
<td>0.11%</td>
<td>0.09%</td>
<td>0.15%</td>
</tr>
<tr>
<td>Total ash</td>
<td>0.5%</td>
<td>1.5%</td>
<td>1%</td>
</tr>
<tr>
<td>Acid Insoluble ash</td>
<td>1%</td>
<td>0.9 %</td>
<td>0.25%</td>
</tr>
<tr>
<td>pH</td>
<td>8.91</td>
<td>9.72</td>
<td>9.89</td>
</tr>
</tbody>
</table>

pH of \textit{Bidlavana} of both batches was more than rock salt. Addition of alkaline material like K from \textit{sajjikshara} may increase the pH of \textit{Bidlavana}. But to surprise pH of \textit{Bidlavana (S)} is more than \textit{Bidlavan} prepared by \textit{puta} method. There may some damage to the alkaline material after application of strong heat to the \textit{Bidlavana}. As there is approximately 20 % less yield is found in the \textit{bidlavana} prepared by \textit{puta} method.

The peaks observed during the XRD of all samples were given in table no.5

**Table 5:** Different Peaks observed in all samples

<table>
<thead>
<tr>
<th>Samples</th>
<th>2 Ø value</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{Bidlavana}</td>
<td>27.34,33.38,56.5,75.37</td>
</tr>
<tr>
<td>\textit{Bidlavana (S)}</td>
<td>27.34,31.62,45.43,56.71,66.22,75.31</td>
</tr>
<tr>
<td>Rock salt</td>
<td>27.34,31.62,33.18,45.13,56.5,66.22,75.37</td>
</tr>
</tbody>
</table>
Figure 1: XRD pattern of Bidlavana

Figure 2: XRD pattern of Bidlavana(S)
Peaks found at 27.34, 56.5 and 75.31 were common in all three samples. Peak at 27.34 is small in rock salt which get increased in bidlavan (S). Peak at 56.5 is small in rock salt which is tall and sharp in bidlavana. A peak at 33.18 is common in rock salt and Bidlavana.

Small Peak at 66.22 is common in rock salt and Bidlavana (S).

Percentage of Sodium and Potassium observed in flame photometry is given in table no. 6.

<table>
<thead>
<tr>
<th>Name of the Sample</th>
<th>Rock salt</th>
<th>Bidlavana</th>
<th>Bidlavana(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>44.86%</td>
<td>42.9%</td>
<td>44.86%</td>
</tr>
<tr>
<td>K</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
</tr>
</tbody>
</table>

Rock salt and Bidlavana prepared by puta method contain equal percentage of Na. There is slight increase in the Na percentage in Bidlavana prepared by heat method only. All three samples contain no Potassium. Asphotometry detect the element in large quantity; need to confirm the percentage of Potassium through Atomic Absorption spectrum.

FTIR analysis: There is appearance of weak peak at 877 cm\(^{-1}\) in the bid lava prepared by both methods. This peak may due to presence of functional group of S-OR esters which was not seen in rock salt. Broad peak was observed at 1117 cm\(^{-1}\) in rock salt and bidlavana prepared by puta method. It may indicate presence of functional group of C-O group. Weak peak at 2905 cm\(^{-1}\) was seen only in rock salt and Bidlavana prepared by simple method. This may indicate presence of functional group of – c-H stretch of amines but it was not seen in the Bidlavana formed by puta method. Only Bidlavan prepared by puta method contain peak at 3475 cm\(^{-1}\) which is indicative of N-H stretch of amides or amines. Broad peak was
observed in all samples in the range of 3300-3650 cm\(^{-1}\) which is indicative of O-H stretch of alcohol or carboxylic acid. *Bidlavana* prepared by simple method shows more weak peaks in the range of 3250 to 3800 cm\(^{-1}\) which may indicative of O-H stretch of phenols from herbs used in the preparation.

**Figure 4:** FTIR report of Rock salt

![FTIR report of Rock salt](image)

**Figure 5:** FTIR of Bidlavana

![FTIR of Bidlavana](image)

**Figure 6:** FTIR of Bidlavana (S)

![FTIR of Bidlavana (S)](image)
TGA-DTA analysis:
Thermograph of the rock salt, Bidlavana, Bidlavana (S) shows stability at 900 °C, 850 °C and 850 °C respectively. A DTA curve indicates that decomposition occurs at 11.45 %, 8 % and 1.45 % w/w in the samples of rock salt, Bidlavana, Bidlavana (S) respectively. Decomposition may be due to loss of some substances from the sample. Bidlavana (S) shows less or negligible weight loss.

**Figure 7:** TGA –DTA of Rock salt

**Figure 8:** TGA-DTA of Bidlavana

**Figure 9:** TGA-DTA of Bidlavana(S)
CONCLUSION

Bidlavans is artificially prepared lavana by using rock salt, sajjikshara, powders of haritaki and amalaki by puta method. More than 800 °C temperatures is required to melt rock salt and react with other ingredients of sajjikashar and powders of amalaki and haritaki. 20 % of the Bidlavana is formed in the puta method. Bid lavan is blackish red in color with alkaline pH. Bidlavana is mainly NaCl with presence of other alkaline substance. Bidlavana mainly contain Na along with Chlorine there is no presence of potassium in bidlavana is seen. Rock salt and Bidlavana mainly contain NaCl in Halite form. There may be inclusion of trace elements in rock salt while preparing Bidlavana. Bidlavana shows different functional groups like S-OR and N-H stretch of amines which may form due to addition of other ingredients and strong heat applied. There is also loss of 20% yield is observed while preparing Bidlavana. Bidlavana mainly contain NaCl.

REFERENCES

5. Jha CB. Ayurvededeya Rasashastra, 1st edt., Delhi: Chowkhabhba Sanskrit Pratishthan, 2011, Ppg.no.70


Source of Support: Nil
Conflict Of Interest: None Declared