

PHARMACEUTICO-ANALYTICAL EVALUATION OF THE BID LAVANA- A HERBOMINERAL FORMULATION

Kawashte AkashDilip¹, Gandhi Piyush Krantikumar²

PG Scholar, Assistant Professor,
College of Ayurved and Research Center, Akurdi, Pune, Maharashtra, India

Email: drpkgandhiji@rediffmail.com

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ABSTRACT

Bidlavana is artificially prepared salt by using three different methods. Some scholars quote it as *Chullika Lavana* which is artificially prepared from ash of *Karir*, *pilu* plant or from excreta of the humans. *Chullikalavana* is mainly contains ammonium chloride. *Bidlavana* is prepared by applying the specific heat pattern to the mixture of rock salt, *sajjikshar*, powders of *haritaki* (*Terminalia Chebula*) and *Amalaki* (*Embelica Officinalis*) in the proportion 82:1:1:1. Also *bidlavana* is prepared by another method in which open pan medium heat is applied till powders converts in the ash form. Rock salts, *Bidlavana* prepared by both methods were analyzed by using sophisticated instruments like XRD, FTIR and TGA-DTA. *Bidlavana* become more alkaline than rock salt. FTIR shows formation of new functional group at 3475 cm^{-1} only in the *bidlavana*. Na is present in 42.9 %, 42.9 % and in rock salt, *Bidlavana* and *bidlavana* (S)-prepared by using simple heat and mixing. *Bidlavana* is blackish red in color mainly contain NaCl in halite form.

Keywords: *Bidlavana*, XRD, FTIR

INTRODUCTION

Salt is the mineral which generally contain NaCl is internal part of the daily food. It is the main constitute 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.¹

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* and *Romak*.³

They mainly contain Na, Cl with slight variation in other elements like K, Fe⁴.

Saindhava, *samudra*, *Sauvarcha* and *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 *pilu*.⁶ *Bid Lavana* is artificially prepared from following methods as mentioned in table no.1

Table 1: Different methods of preparation of *Bid Lavana*

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

As per ancient text *bid lavana* is black in color and having *Ushna* (hot), *Tikshna*, *Laghu* (Light), *sukshma* (Fine) properties. *Bidlavana* is good appetizer; improve the taste sensation. It 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.

Table 2: Details of Preparation of the *Bidlavana*

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

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 drying¹⁰

Accurately weighed 10 gm of the sample was taken and dried in oven at 105⁰c, 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 Ash¹¹

About 2 g accurately weighed sample was incinerated in silica dish at a temperature not exceeding 450⁰C 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 Ash¹²

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 values¹³

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 $\text{CuK}\alpha$ radiation filtered by a nickel foil over the range of diffraction 3-80⁰. The wavelength of the radiation was 1.5405A .

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} .

Determination of TGA-DTA

Thermo gravimetric differential scanning calorimeter analysis was carried out using TG-DTA (SDT Q 600 model, TA instruments, USA). About 22.46mg, 20.32mg and 18.04mg of sample of rock salt, *Bidlavana* and *Bidlavana (S)* respectively was taken in Alumina cup holder and heated upto 1000 °c at the rate of 15 °c per min.

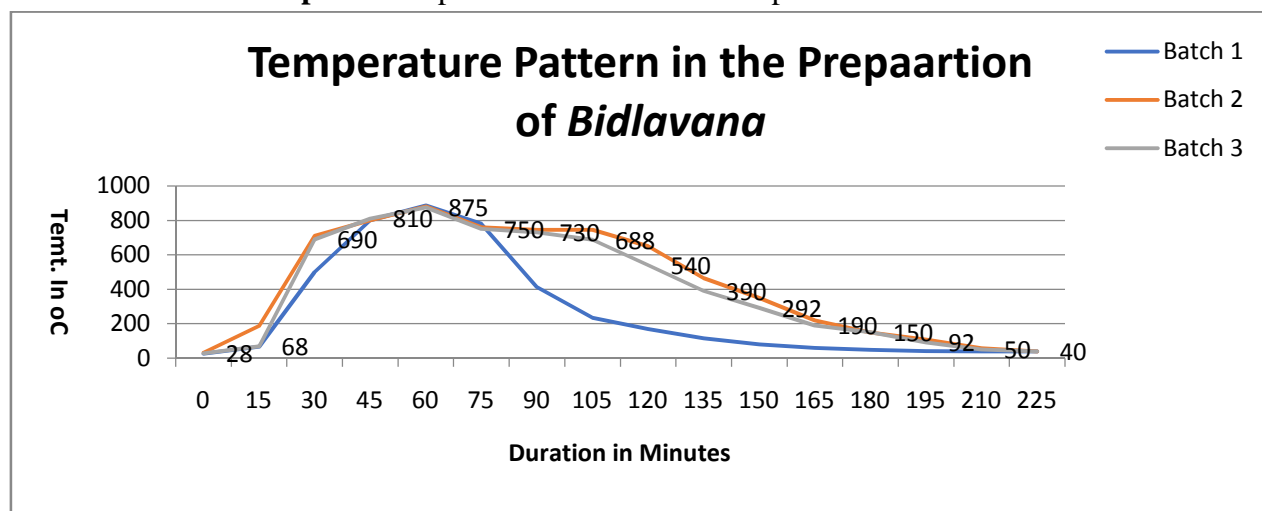
Flame photometry

Different dilutions of Sodium and Potassium from 10µg/ml, 20µg/ml, 30 µg/ml, 40 µg/ml, 50µg/ml and upto 100 µg/ml were prepared a calibration curve was constructed and unknown was found out. For the unknown the stock solution of 1000µg/ml was prepared and final dilution of 50µg/ml was taken for reading.

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 take 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 *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, *Bidlavana* and *Bidlavana(S)*

Parameter	Rock Salt	<i>Bidlavana</i>	<i>Bidlavana(S)</i>
Color	White	Blackish Red	Grey
Odor	Not specific	Not specific	Not specific
Taste	Salty	Salty	Salty
Texture	Smooth	Smooth	Smooth,Fine
Sound	Not specific	Not specific	Not specific

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

Table 4: Physicochemical Analysis of Rock Salt, *Bid lavana*, *Bidlavana(S)*

Parameter	Rock Salt	<i>Bidlavana</i>	<i>Bidlavana (S)</i>
Loss on drying	0.11%	0.09%	0.15%
Total ash	0.5%	1.5%	1%
Acid Insoluble ash	1%	0.9 %	0.25%
pH	8.91	9.72	9.89

pH of *Bidlavana* of both batches was more than rock salt. Addition of alkaline material like K from *sajjikshara* may increase the pH of *Bidlavana*. But to surprise pH of *Bidlavana (S)* is more than *Bidlavan* prepared by *puta* method. There may some damage to the

alkaline material after application of strong heat to the *Bidlavana*. As there is approximately 20 % less yield is found in the *bidlavana* prepared by *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

Samples	2 θ value
Bidlavana	27.34,33.38,56.5,75.37
Bidlavana (S)	27.34,31.62,45.43,56.71,66.22,75.31
Rock salt	27.34,31.62,33.18,45.13,56.5,66.22,75.37

Figure 1: XRD pattern of Bidlavana

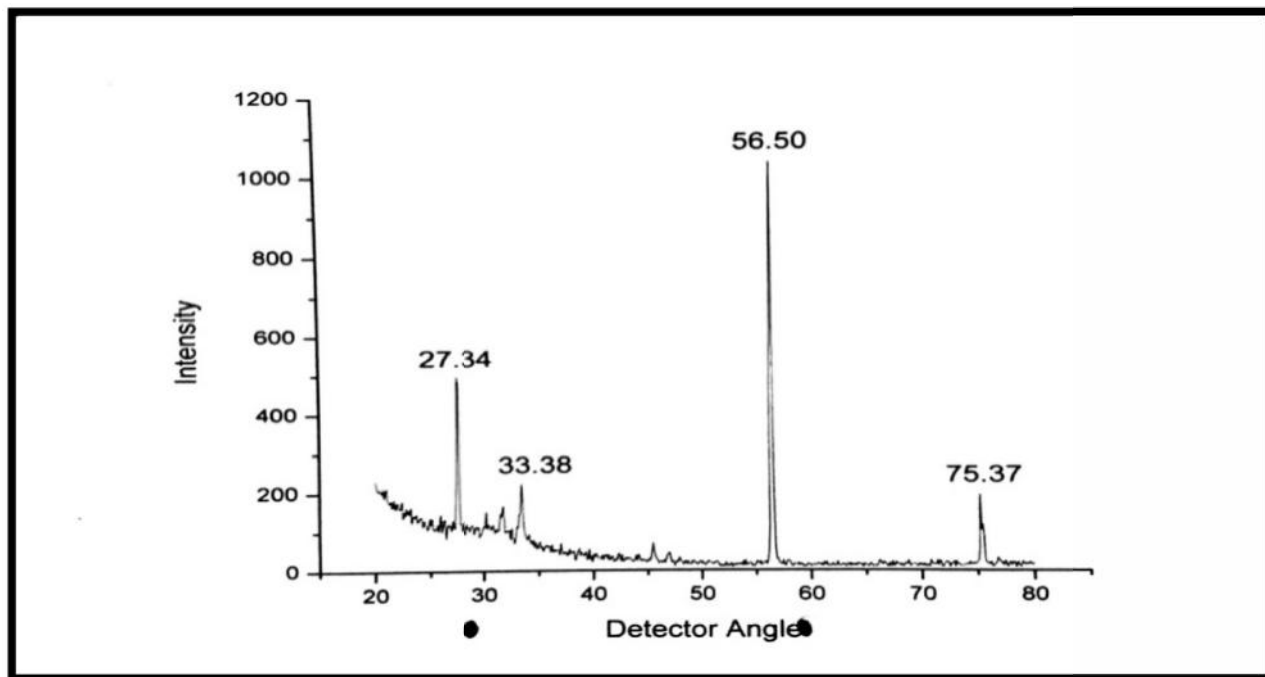


Figure 2: XRD pattern of Bidlavana(S)

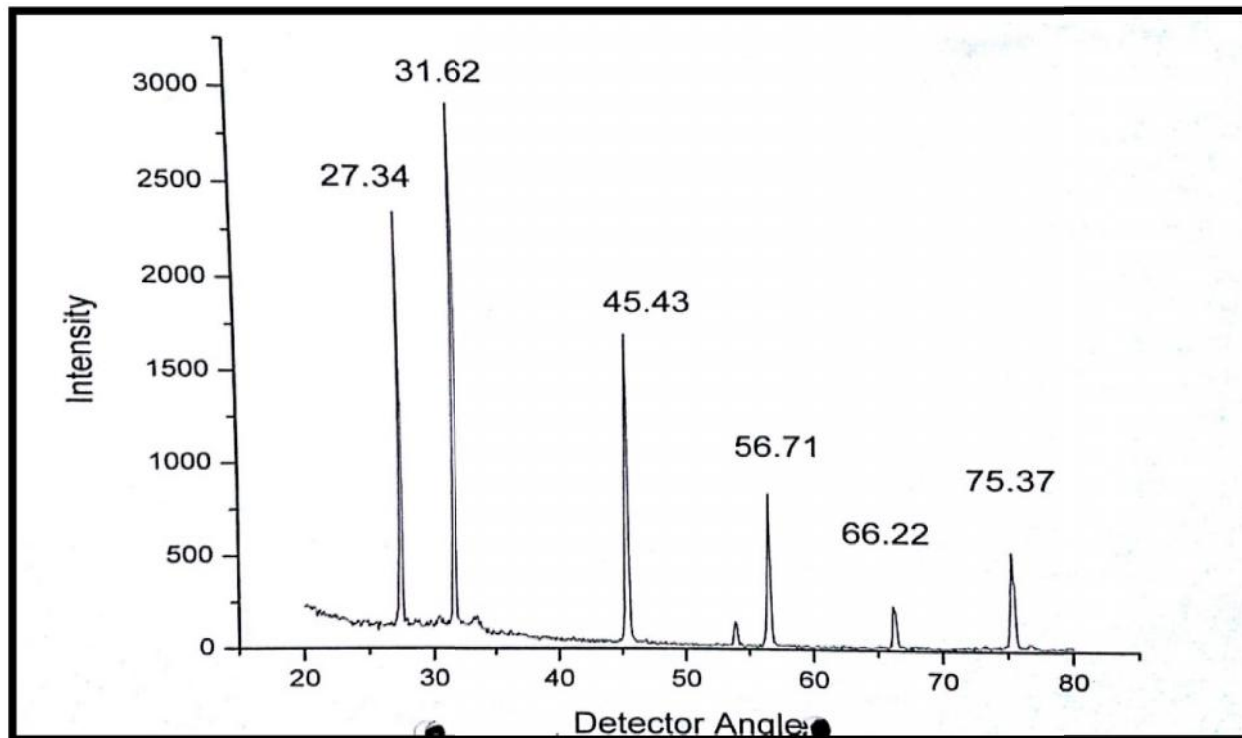
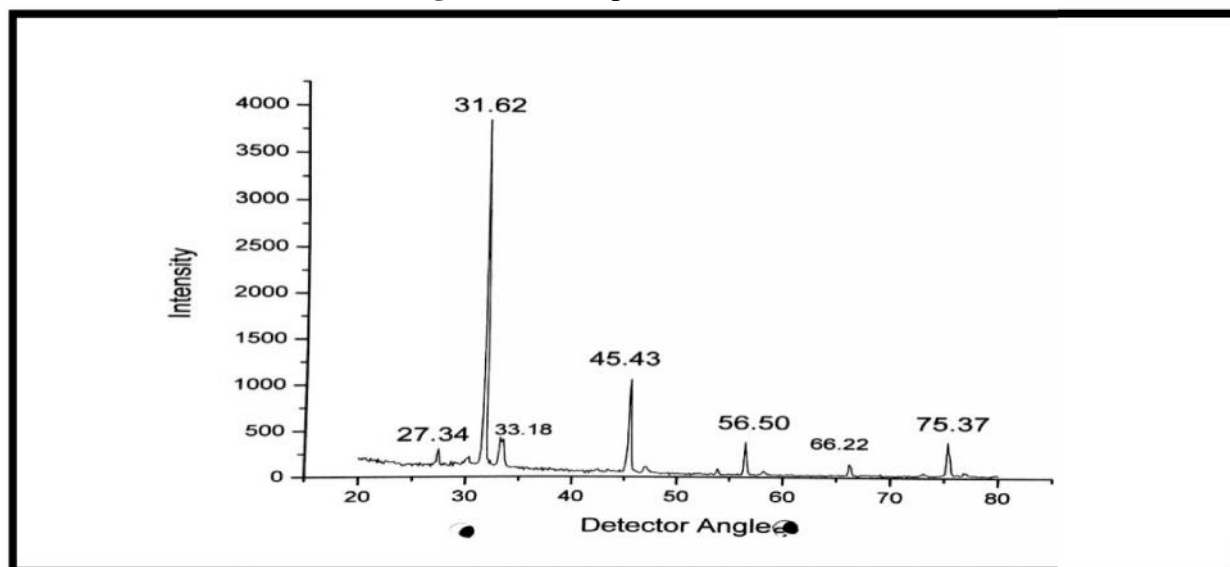


Figure 3: XRD pattern of Rock salt



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 6: Percentage of Sodium and Potassium in rock salt, *Bidlavana*, *Bidlavana*(S)

Name of the Sample	Rock salt	<i>Bidlavana</i>	<i>Bidlavana</i> (s)
Na	44.86% .	42.9%	44.86%
K	Nil	Nil	Nil

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 lavana* prepared by both methods. This peak may due to presence

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

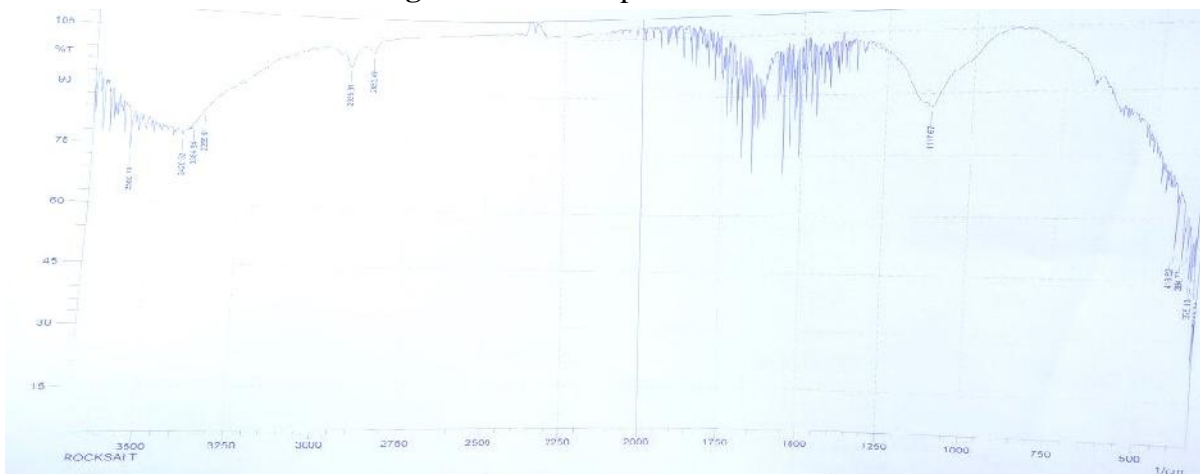


Figure 5: FTIR of Bidlavana

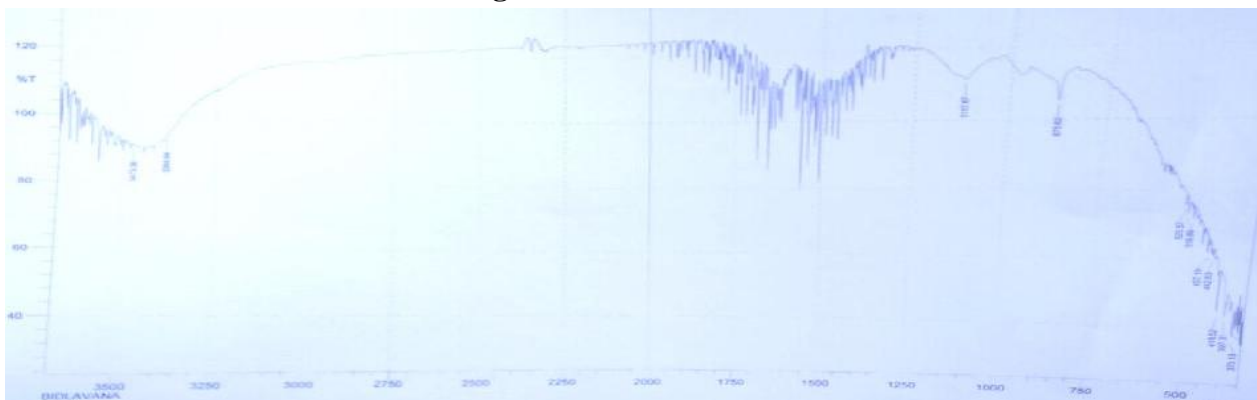
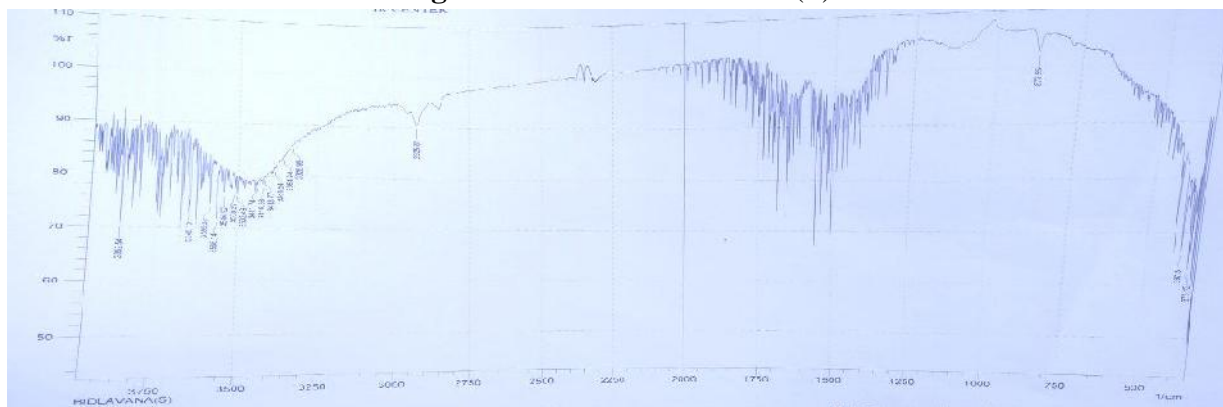


Figure 6: FTIR of Bidlavana (S)



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

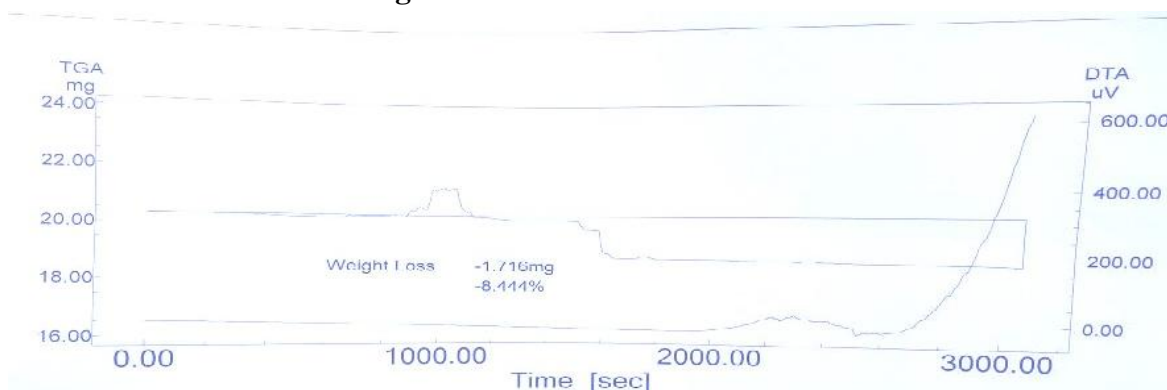
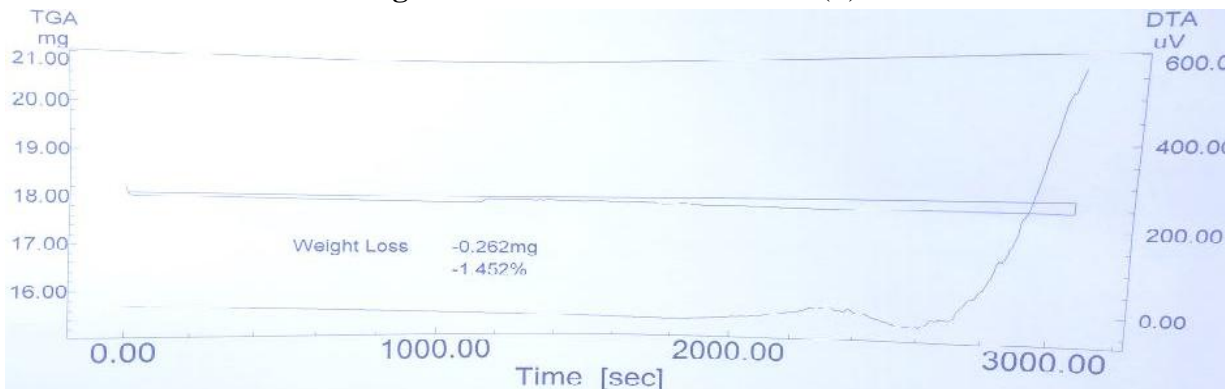


Figure 9: TGA-DTA of Bidlavana(S)



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.

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