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CHARACTERISATION OF *NARIKELA LAVANA*

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ABSTRACT: Background: *Narikela lavana* is a classical formulation which has been described in the samhitas such as Chakradatta, Vangsena, Bhavaprakash, and Rasa tarangini. The main indication of *Narikela lavana* is *Parinaam shoola* which can be broadly correlated with Peptic ulcer as per the modern parameters. As the name suggests, *Narikela lavana* contains only two ingredients- *Narikela* (coconut) and *saindhava lavana* (rock salt). **Aim:** In the present study, *Narikela lavana* is prepared by the method prescribed in Rasa tarangini and its characterization is done. **Materials and Methods:** *Narikela lavana* have been characterized with the help of Physico-chemical analysis, Physical and flow ability parameters, Fourier transform infrared spectroscopy (FTIR), X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray Spectroscopy (EDAX). **Results and Discussion:** *Narikela lavana* is nanocrystalline material having alkaline pH and hygroscopic nature. Its activity on hyperacidity is due to the presence of activated charcoal and alkaline nature. **Conclusion:** *Narikela lavana* could prove to be highly effective in hyperacidity (*amlapitta*) and peptic ulcers (*Parinaam shool*).

INTRODUCTION: Ayurvedic system of medicine is believed to promote positive health and maintain organic resistance against infection by establishing the body's equilibrium and conditioning the body tissues. Herbal drugs have served the human society from time immemorial in curing various ailments. But in recent years, the alarming question which is arising around the globe is non availability of scientific information or data to prove the efficacy of Ayurvedic products [1]. So, there is an urgent need to answer this question by adapting advance techniques for the characterisation of Ayurvedic drugs.

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Narikela lavana is one of the classical formulations of Ayurveda, which comes under *kshara kalpana* because it possesses the properties of *kshara* (Alkaline properties). Due to this, *Narikela lavana* is also named as *Narikela kshara* by some scholars of Ayurveda [2]. *Ksharas* are derivatives of plant drug ashes in the form of solutions, powder or crystals, all of which have the basic quality of being alkaline. As the name suggests, *Narikela lavana* consist of two ingredients i.e. *Narikela* (coconut) and *saindhava lavana* (rock salt). Its main indications according to the classics are *amlapitta* (hyperacidity) and *parinaam shool* (peptic ulcers) [3].

Narikela lavana is prepared by the application of heat in *mahaputa* having temperature of around 800-1000 ^{0}C. This leads to the formation of activated charcoal, having highly porous structure with large surface area [4]. Also, the activated carbon constitutes a large number of active sites for

adsorption because of the disordered lattice and the presence of broken C-C bonds. Due to its broad spectrum of adsorptive activity and rapidity of action, activated charcoal can absorb large amount of toxins [5] and in case of *amlapitta* (hyperacidity) the toxin substance is 'ama' (sticky substance produced due to indigestion).

Therefore, the present study focuses on the preparation of *Narikela lavana* by the method described in *Rasa-tarangini* and characterization with the help of various physico-chemical parameters, FTIR, XRD and SEM-EDAX.

MATERIALS AND METHODS:

Method of preparation: Mature fruit of coconut (*Narikela*) was taken and its outer fibers were removed. A hole was made through an eye of the coconut and its water was removed completely. Then finely powdered rock salt (*Saindhava lavana*) was filled into it through that eye. The hole was then sealed with mud and whole of the coconut was covered with the layer of thin cotton cloth impregnated with mud. When dry, it was subjected to the heat of around 1000 ^{0}C temperature in a pit full of cow-dung cakes. In this way, a grayish black coloured ash of coconut and rock salt is obtained. This ash is known as *Narikela lavana* [6].

Characterization techniques:

i. **Physico-chemical characterization:** The samples were analysed for physico-chemical parameters such as pH value, loss on drying, total ash, acid insoluble ash and water soluble extractive.

ii. **Physical properties:** Particle size distribution, true density, bulk density and tapped density were measured.

iii. **Flow ability parameters:** Powder flowability was measured with the help of carr's index, hausner's ratio, compactability and cohesiveness, hygroscopicity and angle of repose.

All the above analytical tests were performed in International Testing Centre (ITC), Panchkula.

iv. **FTIR:** FTIR spectrum of *Narikela lavana* was recorded in the region 4000-625 cm^{-1}, in Devansh Testing and Research Laboratory Pvt. Ltd., Roorkee.

v. **XRD and SEM-EDAX:** X-ray diffraction pattern and SEM-EDAX of *Narikela lavana* were recorded in IIT, Roorkee. The powder X-ray diffractometry of *Narikela lavana* is performed on diffraction angle of 2-theta and the range for diffraction was 10-90^0 at 2 theta scale. The average crystallite size of the entire sample was determined by Scherrer's equation-

$$D = \lambda \frac{K}{\beta cos\theta}$$

Where, k is the Scherrer's constant (0.9); λ, the X-ray wavelength (0.154 nm); β, the peak width at half of its height or full width at half maximum (FWHM); and θ, the Bragg's angle.

RESULTS and DISCUSSION: Physico-chemical analysis of *Narikela lavana* showed alkaline pH, negligible water content, large amount of inorganic matter (due to *saindhava lavana*) as indicated by the value of total ash, acid-insoluble ash indicated 52.88% silica and small amount of water soluble extractives.

Regarding particle size of *Narikela lavana*, maximum number of particles passed through sieve no.150 (106µm mesh size). Other physical properties are mentioned in **Table 2**, which show bad flow properties of *Narikela lavana* powder. The powder is also slightly hygroscopic due to presence of NaCl (*Saindhava lavana*) in it.

TABLE 1: PHYSICO-CHEMICAL PARAMETERS OF *NARIKELA LAVANA*

Tests	Results
pH value	9.47
Loss of drying	0.14 %w/w
Total ash	95.65 %w/w
Acid insoluble ash	52.88 %w/w
Water soluble extractive	1.41 %w/w

TABLE 2: PHYSICAL PROPERTIES OF *NARIKELA LAVANA* POWDER

Tests	Results
Particle size distribution	93.43 %w/w
True density	0.7124
Bulk density	0.8199 gm/ml
Tapped density	0.9960 gm/ml

TABLE 3: FLOWABILITY PARAMETERS OF *NARIKELA LAVANA*

Tests	Mean
Carr's index	19.20
Hausner's ratio	1.25
Compactability and Cohesiveness	17.60
Hygroscopicity	0.90
Angle of repose	59

The carrier as well as the co-ingredient of the formulation is endocarp of coconut in fresh form with water content. The salt is incinerated with endocarp and the variable in the formulation fabrication is water content of the endocarp. As endocarp as well as salt consist of lot of components that are chemically active with their specific structure. The changes in chemical composition of endocarp could be resulted due to incineration and water content of endocarp could also have a significant. As the final product is the ash form along salt, the variables were applied to assess the chemical composition change of final product and compared. The chemical entities effects on living beings depend upon the binding with internal receptors and it results in therapeutic effect. Hence, the presence of various functional groups is determined by Fourier transform infrared spectroscopy. In the sample of *Narikela lavana*, carbonyl group is present at 1686 cm^{-1}.

The prominent peaks for saturated aliphatic aldehyde, alpha-beta unsaturated ester and alpha beta unsaturated aldehyde are also observed in the spectrogram. Primary amino groups were present in the form of peaks at 1638 and 1610 cm^{-1} wave numbers. The alcoholic and hydroxyl group's presence is seen in the form of peaks at 1261, 1217, 1193, 1132, 1114 and 1030 cm^{-1}. In finger print region, the presence of Alkenes 1˚2˚amines, Aromatics, Alkyl halides, Alkanes and Alkynes is observed in the form of wave numbers.

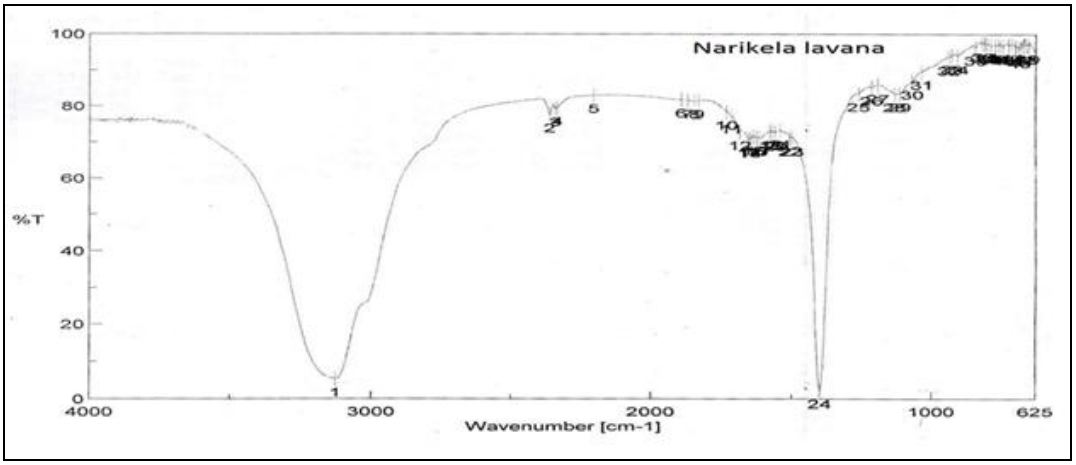

FIG. 1: FTIR OF *NARIKELA LAVANA*

The component used in the study to prepare *Narikela lavana* is *Saindhava lavana* that is the dig out material from the earth and is mineral in nature. The major component of *Saindhava lavana* is sodium chloride and some of the other minerals are also present in minor quantities. The other component of the preparations is endocarp of coconut. As sodium chloride is crystalline in nature, the endocarp and its mineral and carbon components might have an impact on crystallinity of sodium chloride. The X-ray diffraction pattern of *Narikela lavana* has been shown in **Fig. 2**. The result of the study indicated that numbers of sharp X-ray diffraction peaks are present in diffractogram of sample that showed the crystalline nature of formulation. The discrete and definite peaks in the sample might be due to incineration of all the carbon matter of the samples during incineration. Any broadness in the peaks is not seen that indicated no amorphous material. The sharp peaks of x-ray diffraction were obtained at 27.3236^0, 31.6231^0, 45.3404^0, 53.8564^0, 56.3987^0, 66.0786^0, 75.1827^0 and 83.8631^0 angle (2θ) having the crystallite size of 41.52652, 104.8727, 87.46052, 37.70928, 38.14853, 48.13522, 36.37724 and 74.12817 nm respectively. The average crystallite size of the sample is 58.54477 nm.

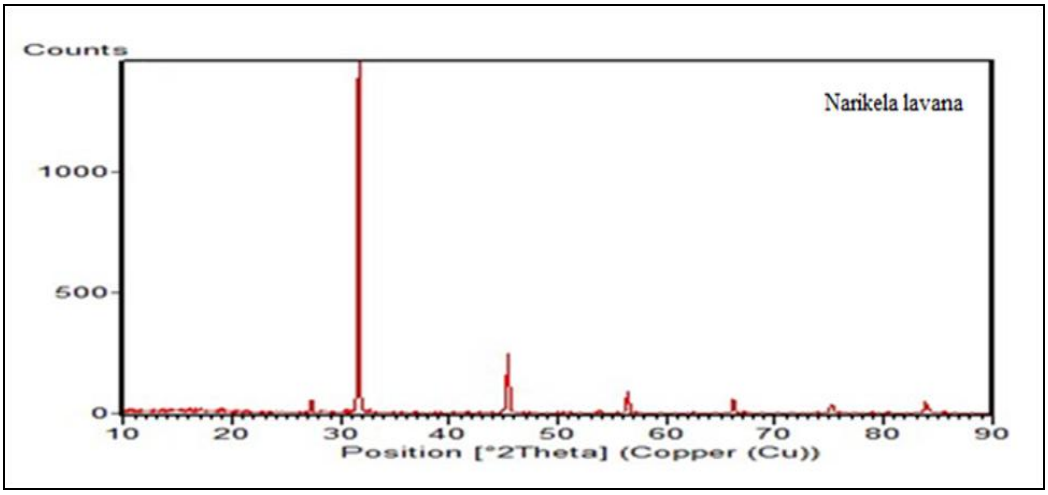

FIG. 2: X-RAY DIFFRACTION PATTERN OF *NARIKELA LAVANA*

SEM images of *Narikela lavana* shows that the smaller particles got agglomerated in the form of clusters **(Fig. 3** and **4)** [6]. Quantitative determination of elemental composition by EDAX shows the presence of Na, Cl, K, Mg, C, O, Si, where carbon (54.17 wt %) is present as major element followed by chloride (23.52 wt %) and sodium (17.18 wt %) **(Fig. 5** and **Table 4)**. This activated carbon acts as adsorbing agent for produced toxins in the stomach due to hyperacidity.

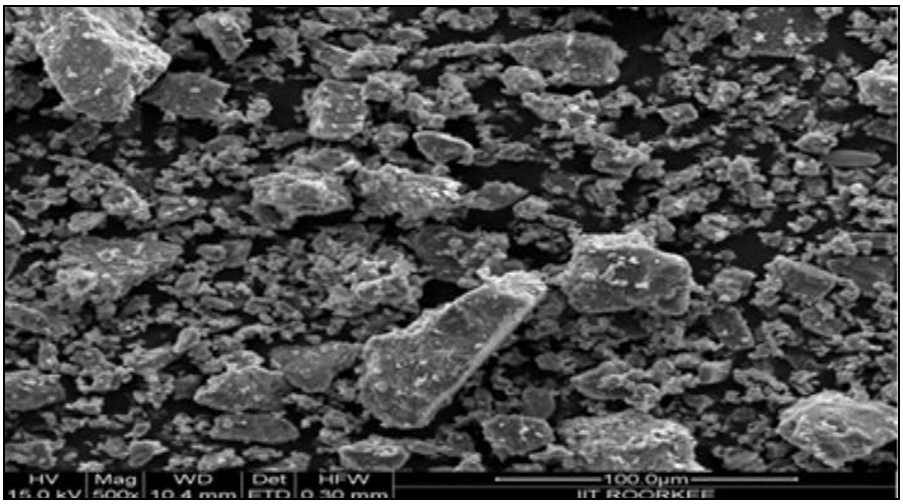

FIG. 3: TWO DIMENTIONAL SEM IMAGE OF *NARIKELA LAVANA* (500X)

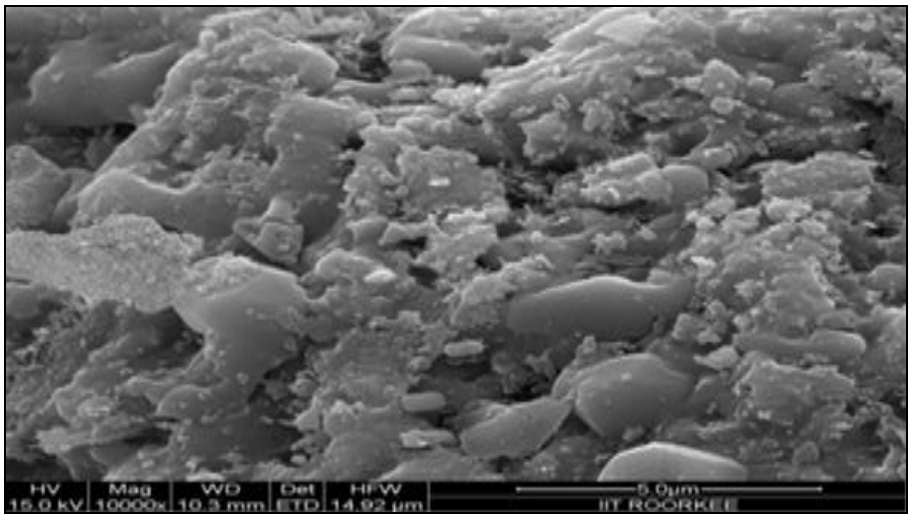

FIG. 4: TWO DIMENTIONAL SEM IMAGE OF *NARIKELA LAVANA* (10,000X)

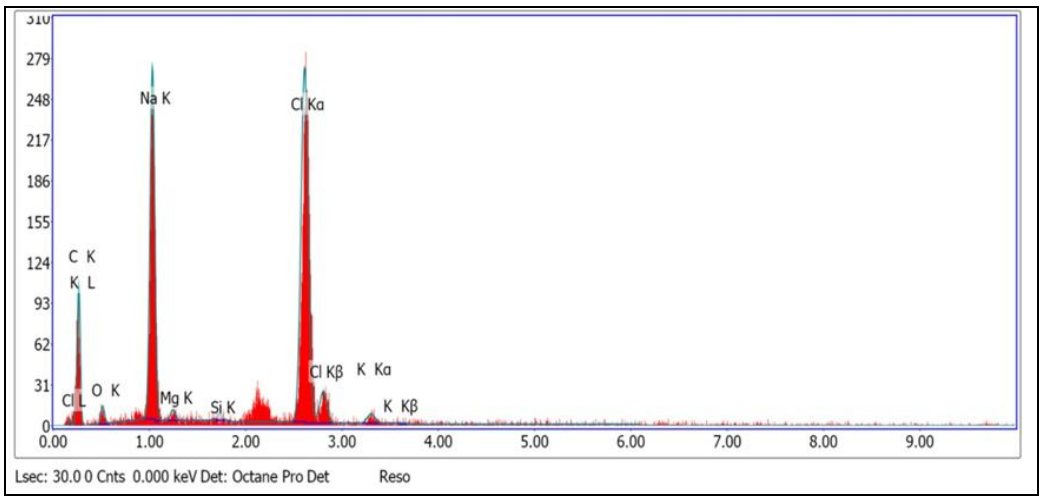

FIG. 5: EDAX GRAPH OF *NARIKELA LAVANA*

TABLE 4: ELEMENTAL COMPOSITION OF *NARIKELA LAVANA*

Elements	Weight %	Atomic %
Na	17.18	12.07
Cl	23.52	10.72
K	0.91	0.38
Mg	0.39	0.26
C	54.17	72.84
O	3.56	3.59
Si	0.26	0.15

CONCLUSION: *Narikela lavana* has been in use since 11th century. *Acharya Chakarapani* has described it first time in *"Parinaam shool Chikitsa"* but the preparation of *Narikela lavana* is elaborated by Acharya Sadananda Sharma in his renowned text *Rasa tarangini*. It is basically a nanocrystalline material which consists of activated carbon and other elements like Na, K, Cl, Mg etc. The porous surface of activated charcoal has a negative electric charge which will attract the positive charged unwanted toxins and gas and help to remove them. It also helps in moving unwanted bacteria through the digestive tract faster so that before they multiply and spread, they are eliminated from the body [4]. Moreover; *Narikela lavana* is highly alkaline in nature. Due to these factors, it could prove to be very efficient in treating hyperacidity (*amlapitta*) and peptic ulcers (*Parinaam shool*).

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CONFLICT OF INTEREST: Nil.

REFERENCES:

1. Narayana D: Evidence for ayurvedic products' efficacy: The devil is in details. Ancient Sci Life 2016; 35:193-4.
2. Shastri BM: Bhavaprakash of Bhavmishra, Parinaamshool chikitsa; Shooladhikar: Verse 71-72. Varanasi: Chaukhamba Sanskrit Sansthan, 2006; 330.
3. Shastri KN: Rasa Tarangini of Sadanand Sharma, Ksharavisheshadi vigyaniya: Chapter-14, Verse 123-129. New Delhi: Motilal Banarasidas, 1979; 348.
4. Kothari, Vasavdutta, *et al*.: "Scientific basis for action of *Narikela lavana*." Pharma Science Monitor 2015; 6(3).
5. Kumar M, Gupta RC: Industrial uses of wood charcoal. Energy sources 1998; Aug 1; 20(7):575-89.
6. Acharya Balkrishan *et al*.: "Structural and Optical studies of Traditional Indian Medicine: Kajjali and *Narikela lavan*." Journal of Young Pharmacists 2016; 8(4):492.

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