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Research Article

COMPARATIVE ANALYTICAL STUDY OF *SAJALA* AND *NIRJALA NARIKEL LAVANA*

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ABSTRACT

Advancement being the heart of development any science, *Ayurveda* has been no exception to this. Various basic formulations have been mentioned in the classical texts i.e. *Samhitas* and quite a few were added later on, by contemporary *Acharyas*. *Lavana Kalpana* is one of them. *Lavana Kalpana* literally denotes any pharmaceutical formulation comprising *Lavana* i.e. any type of salt along with other herbal ingredients. *Narikel Lavana* has been advised under the *Rogadhikara* of *Parinaam Shula*. *Acharyas* have explained two separate methods of preparation of *Narikel Lavana*: *Sajala* (retaining the water inside coconut) and *Nirjala* (without coconut water). *Nirjala Narikel Lavana* has been prepared by using *Mahaputa* and *Sajala Narikel Lavana* in *Kukkutaputa*. Current study is aimed at preparation, standardization and comparative study of *Narikel Lavana* as per two different references with the help of sophisticated analytical technique, XRF. Other methods of examination of *Ayurvedic* drug formulations such as organoleptic evaluation, physico-chemical tests are also employed. The differences between these values and variations in the XRF analysis have been elaborated here. Organoleptic evaluation of both the samples shows no difference, whereas minor variations are observed in the physico- chemical parameters. XRF analysis has clearly indicated the different between the elemental composition of both *Sajal* and *Nirjala Narikel Lavana*.

KEYWORDS: *Narikel Lavana, Sajala, Nirjala*, XRF.

INTRODUCTION

Ayurveda is an extravagant resource where various newly developed manufacturing methods of herbal and mineral drugs can be explored. In most ancient and available classical texts like *Bruhattrayi,* a large number of herbo- mineral ingredients have been used to prepare the medicinal formulations. The branch of pharmaceuticals i.e. *Bhaishajya-kalpana* is evident since the time of *Charak Samahita*. Various forms of medicines with their manufacturing processes such as *Taila, Ghrit, Avleha, Ghana, Asava, Arishta* etc. are available in the *Ayurvedic* classics, similarly *Lavan Kalpana* was also introduced in the classical text later on. *Lavana Kalpas* are the formulations which contain any of the five types of *Lavanas,* especially *Saindhav Lavana* along with other herbo-mineral components. *Narikel Lavana* is one such important and commonly used *Lavana Kalpa*. It consists of *Narikel* along and *Saindhav Lavana*. *Narikel Lavana* is recommended under the *Rogadhikara* of *Parinaam Shula*. *Narikel Giri* (coconut meat) and *Narikel Jala* are one of the richest sources of essential electrolytes. It predominantly contains high amount of Sodium and Potassium[(1)]. Which is probably why *Narikel Lavana* is found to be effective against *Parinaam Shula* and other acid peptic disorders. *Saindhav Lavana* is essentially *Pittahara. Saindhav* also has *Sheeta veerya.* With its *Shamana* property, *Saindhav* pacifies the vitiated *Pitta.* It also reduces secretion of acid in the stomach and prevents acid reflux. *Saindhav* is again reach in electrolytes such as Sodium, Potassium, and Magnesium etc. *Narikel Lavana*is successfully used by senior *Ayurved* practitioners in day to day clinical practice. The timely evolution in tedious manufacturing processes of *Narikel Lavana* is also evident in the classical literature. The evolutionary changes can be observed in the preparation methods of the same formulation, preceded by experimentation as time elapsed. Hence, it is the need of hour to develop a standard operating process with its standardization in terms of latest sophisticated analytical techniques. Along with these methods, the age old and time tested methods of evaluation of standard product such as organoleptic characters are also studied. The current comparative study is aimed to develop the standard manufacturing process of *Narikel Lavana* with its standardization, preparation by two methods, namely *Sajala* (retaining the water inside coconut) and *Nirjala* (without coconut water). There are two separate methods mentioned for preparation of the two types of *Narikel Lavana*.

MATERIAL AND METHOD

Material

Six coconuts, rock salt, fuller's earth *(Multani mitti)*, cotton cloth, cow dung cakes, mortar and pestle.

Method

3 batches of each *Sajala*and *Nirjala Narikel Lavana* were prepared as per the classical reference of *Bhavprakash nighantu*[(2)] and *Rastarangini*[(3)] respectively.

a. Sajala Narikel Lavan: It was prepared in the teaching pharmacy of department of *Rasa Shastra* and

Bhaishajya Kalpana at YMT Ayurvedic medical college, as per the reference of *Bhavprakash nighantu.*

Step I: 3 water containing coconuts of weight 664g, 536g, 604g respectively were procured from APMC market of Navi mumbai and were cleaned by removing husk with the help of knife.

Step II: The coconut water from each sample was drained in a clean SS (stainless steel) vessel by opening the functional pore of each coconut with the help of sharp knife and was measured batch wise.

Step III: The powdered rock salt (*Saindhav*) was dissolved in the coconut water until saturated. The quantity of rock salt required for complete dissolution in the coconut water was noted batch wise.

Step IV: the coconut water with dissolved rock salt was refilled in the respective coconuts with the help of glass funnel. The opened eyes (pores) of the coconuts were closed with the help flaps of coconut shell and were sealed by wet fuller's earth *(Multani mitti)*.

Step V: 3 coconuts filled with rock salt were coated with cotton cloth and fuller's earth *(Multani mitti)*. The thickness of the coating (*Kapadmitti*) was kept 1 *Angula* (1.5 cm) on each sample. Each sample was dried in shade (*Chhayashushka*) after coating with fuller's earth *(Multani mitti).*

Step VI: Each rock salt filled, coated coconut was subjected to *Kukkutputa* as per the reference of *Bhavprakash nighantu*. For *Kukkutputa*[4], 1 ft X 1 ft pit was prepared adjacent to the teaching pharmacy of institute and 42 cow dung cakes (*Upal*) of size 8 inches diameter each were arranged evenly. Each sample was incinerated in *Kukkutputa* in open air and temperature of each *puta* was noted half hourly using alaser pyrometer. The samples of *Sajal Narikel Lavana* were kept for self-cooling up to 12h (*Swangsheeta*). The characteristics (*Siddhilakshanas*) of the processed samples were observed and noted. After self-cooling, the coating and shells of the samples were removed gently and each sample was rubbed in mortar and pestle to obtain the final product from each sample. Each final product was weighed and subjected to physicochemical analysis.

b. Nirjala Narikel Lavan: It was prepared in the teaching pharmacy of the department of *Rasa Shastra and Bhaishajya kalpana*at YMT ayurvedic medical college as per the reference of *Rasatarangini.*

Step I: 3 water containing coconuts of weight 697g, 626 g, 670g respectively were procured from APMC market of Navi mumbai and were cleaned by removing husk with the help of knife.

Step II: The coconut water was drained from each sample in a clean SS vessel by opening the functional pore of the coconut with the help of sharp knife.

Step III: According to the selected reference, 10 *Tole* (125mg) rock salt was filled in each coconut, the pores were sealed and each coconut was coated by cotton cloth and wet fuller's earth *(Multani mitti)*.The thickness of *Lepa* was kept up to 1 *Angul* (1.5cm). The samples were dried in shade (*Chhayashushka)*.

Step IV: Each rock salt filled, coated coconut sample was subjected to *Mahaputa* as per the reference of *Rastarngini*[5]. For *Mahaputa,* a pit measuring 91cm X 91cm was prepared in open space around the teaching pharmacy of the institute. The pit was filled with total 1500 cow dung cakes. Out of which 1000 cakes were arranged evenly at the base of the pit, then the coated coconuts were placed carefully and remaining 500 cow dung cakes placed above these coconuts. Finally the cow dungs cakes were incinerated. Temperature of the *Mahaputa* was noted at regular intervals (every 30 mins.) with the help of Laser pyrometer. The samples of *Nirjala Narikel Lavana* were kept for self-cooling for 24h (*Swangasheeta*). The characteristics (*Siddhilakshanas*) of the processed samples were observed and noted. After self-cooling, the coating and shells of the coconuts were removed gently and each sample was rubbed in mortar and pestle to obtain the final product from each sample. Each final product was weighed and subjected to physicochemical analysis.

OBSERVATIONS AND RESULTS

Table 1: Physico- chemical parameters[6] of *Sajala Narikel Lavana*

Parameter	Value
pH	10.25
Total Ash %	98.33
Acid insoluble ash %	6.13

Table 2: Physico- chemical analysis[6] of *Nirjala Narikel Lavana*

Parameter	Value
pH	9.21
Total Ash %	98.35
Acid insoluble ash %	0.1

Table 3: Organoleptic evaluation[7] of *Narikel Lavana*:

	Sajal NarikelLavana	***Nirjal Narikel Lavana***
Color	Grayish black	Grayish black
Odor	Pungent	Pungent
Taste	Salty (*Lavana Rasatmak*)	Salty (*Lavana Rasatmak*)
Texture	Rough, Fine	Rough, Fine
Sound	Not specific	Not specific

XRF (X- ray fluorescence) analysis was carried out at Varsha bullion and elemental analab, Mumbai.

Table 4: *Sajal Narikel Lavan* XRF analysis

Element	Mass (%)	Intensity	Formula	Mass (%)
Na (Sodium)	8.285	0.022	Na_2O	11.167
P (Phosphorus)	1.224	0.165	P_2O_5	2.804
S (Sulphur)	1.231	0.314	SO_3	3.074
Cl (Chlorine)	72.574	9.257	Cl	72.574
K (Potassium)	6.879	0.429	K_2O	8.287
Ca (Calcium)	1.410	0.109	CaO	1.972
Fe (Iron)	0.085	0.118	Fe_2O_3	0.122
O (Oxygen)	8.313			

Table no. 5. *Nirjala NarikelLavan* XRF analysis

Element	Mass (%)	Intensity	Formula	Mass (%)
Na (Sodium)	8.481	0.014	Na_2O	11.432
Si (Silicon)	0.933	0.043	SiO_2	1.995
P (Phosphorus)	1.193	0.102	P_2O_5	2.733
S (Sulphur)	1.908	0.308	SO_3	4.766
Cl (Chlorine)	63.673	5.617	Cl	63.673
K (Potassium)	5.868	0.267	K_2O	7.069
Ca (Calcium)	5.117	0.287	CaO	7.159
Fe (Iron)	0.769	0.737	Fe_2O_3	1.100
Sr (Strontium)	0.062	0.397	SrO	0.073
O (Oxygen)	11.997			

DISCUSSION

The current comparative study was undertaken to develop the standard manufacturing process for *Narikel Lavan*. Due to evolutionary changes occurred in *Ayurvedic* pharmaceuticals, 2 methods of preparation of *Narikel Lavan* were observed in literary review. *Bhavprakash nighantu* has for the first time described the method of preparation of *Narikel Lavan* in which coconut containing water (*Sajala Narikel*) was used. The method of *paka* (heating) was also specifically mentioned i.e. *Kukkutputa* has been implemented for *Sajala Narikel Lavan* preparation. As per the classical references of *Kukkutputa*, the samples were heated using total 42 cow dung cakes (*Upala*). In the current study, it was observed the optimum temperature of *Kukkutputa* reached upto 424 ºc. For the preparation of *Sajala Narikel Lavan*, comparatively low heat was given i.e. 424ºC than that in case of *Nirjala Narikel Lavan* where *Mahaputa* has been implemented and the maximum temperature of *Mahaputa* was up to 1050ºC.As the coconuts were full of water in *Sajal Narikel Lavan*, they might burst due to intolerance of high temperature. *Nirjala Narikel Lavana* is prepared as per the reference of *Rasatarangini*. Hence, the coconuts which were of devoid of water, were subjected to *Mahaputa*. These coconuts being free of water, could tolerate the high temperature in the *Mahaputa*. Due to coating of fuller's earth *(Multani mitti)*, the temperature rises slowly and also cools very slowly which could be helpful for prolonged and thorough *Paka* of the ingredients in the drug. As per table no.1 and 2, Physico chemical analysis of both *Sajala* and *Nirjala Narikel Lavana* revealed that the total ash values of both the samples showed no significant difference. Acid insoluble ash % in the *Sajala Narikel Lavana* was 6.13 whereas it was much lower i.e. 0.1 in the *Nirjala Narikel Lavana*. Acid insoluble ash indicates the presence inorganic matter such as silica in the tested sample. pH of *Sajala Narikel Lavana* was slightly higher (10.25) than that of *Nirjala Narikel Lavana* which was 9.21.As per Table no. 3, Both *Sajala* and *Nirjala Narikel Lavana* were found to have similar organoleptic characters, i.e. both were grayish black in color and had a characteristic pungent smell. Both were salty when tasted. The powder was smooth textured and very fine to touch. But the XRF analysis in table no. 4 and 5 showed remarkable difference between the two samples. Mass % of Elemental calcium was found to be 1.410 in *Sajala Narikel Lavana* and the same was found to be 5.117 in *Nirjala Narikel Lavana*. Elemental oxygen mass % was observed to be 8.313 in *Sajala Narikel Lavana*, whereas it was 11.997 in *Nirjala Narikel Lavana* sample. Mass % of elemental iron was 0.085 in the *Sajal Narikel Lavana*, the same was 0.769 in *Nirjala Narikel Lavana*. *Nirjala Narikel Lavana* showed presence of Strontium with a mass % of 0.062, which was absent in the *Sajal Narikel Lavana. Nirjala Narikel Lavana* contained elemental silicon in the mass % of 0.933 and was absent in the *Sajal Narikel Lavana*. Rest all the elements such as sodium, phosphorus, Sulphur, chlorine and potassium were found in approximately similar quantities.

CONCLUSION

Narikel Lavan has been recommended under the *Rogadhikara* of *Parinaama Shula.* From the above mentioned observations, it can be concluded that implementation of either of the methods for obtaining *Narikel Lavan* results in least remarkable difference in majority of the physico- chemical properties. Whereas, XRF analysis has shown that *Nirjala Narikel Lavan* contains

higher amount of elemental Calcium as compared to *Sajala Narikel Lavana*. Electrolytes like Calcium and Potassium might be responsible for the antacid property of this formulation. The pH of *Sajala Narikel Lavana* is higher than that of *Nirjala Narikel Lavana*. The higher alkalinity of *Narikel Lavana* may also play an important role in the therapeutic activity of this *Kalpa*. Final product obtained after both the procedures had been completely incinerated and proper *Paka* was achieved. Preparation of *Sajal Narikel Lavan* required comparatively lesser heat, i.e. lesser amount of fuel is consumed during the entire procedure as compared to *Nirjala Narikel Lavana.*

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