A COMPREHENSIVE REVIEW ON SNUHIKSHIR (LATEX OF Euphorbianerifolia-Linn.)

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ABSTRACT

Snuhikshir (latex of EuphorbianerifoliaLinn) has been the object of study as it is one of the important ingredients in preparation of Ksharsutra in Ayurveda. Hence, in order to comprehend the formation of Snuhikshir within the plant, one needs to understand how the secretory activity of plant is controlled, and how it may change in response to changes in environment. In order to understand this phenomenon in plants, literary research was carried out on the spurge Snuhi (Euphorbia nerifolia linn.). With the purpose to understand the concept of lactiferous vessels and tapping system of Snuhi, literature of Rubber Plant (Heveabrasiliensis), as latex of both plants are currently studied as a potential source of hydrocarbon and moreover, both belong to the same family of Euphorbiaceae Ayurveda classifies the environmental changes in the atmosphere into 6 categories termed as ‘Ritu’ and Ayurvedic Scholars have considered these Ritu (seasons) for planning treatment modalities and collection of useful parts from plants. So, it has been advocated that the collection of Kshir (Latex) needs to be done in Sharadritu (Autumn) with an exception of Snuhi. Accordingly, Acharya Charak has advocated that Kshir (i.e. latex) of Snuhi has to be collected from the stem of the plant which has completed 2-3 years of existence and preferably should be tapped at the end of Shishirritu which corresponds to mid January. It is attention-grabbing to note the specification of plant age of 2-3 years and best time for tapping of latex is considered as terminal stages of the cold season. Hence, present work is a literary review of Snuhikshir its time and season of collection as per Acharya Charak, scientific way of collection, preservation, identification on microscopy, analytical data and its clinical utility.

Keywords: Snuhi, Snuhikshir, Euphorbia nerifolia Linn., Dravyasangrahankal, ksharsutra
Snuhi (Euphorbia neriifolia Linn.) finds its place as one of the important dravya (medicinal plant) in Dhanwantari Nighantu (classical text of glossary of herbal drugs) of 6th century. …which is thereafter found to be mentioned in all the Nighantus. The classical textbook of Ayurveda Pharmaceutics and Indian Alchemy, Rastarangini, has mentioned Snuhikshir (latex of EuphorbiaNerfolialinn. under UpvishaVarga (category of sub poisons). In spite of irritant nature because of ushna, tikshnagunadharma (hot and irritant characteristics) and tikshnavirechana (drastic purgative) property, it is used in many Kashtasadhyavyadhis (Diseases which are difficult to treat) like Udara (Ascites), Shotha (Anasarca) etc. Acharya Charak in Sutrasthana mentioned Snuhi in Shodhanupyogi Shatvriksha (Included in 6 important trees used for detoxification of body) and has compiled a separate chapter in Charak Samhita thereby, introducing the importance of the drug for tikshnavirechanupakram (purgative activity).

While considering the therapeutic uses of Snuhi, the latex of the plant is widely used in preparation of Ksharsutra (medicated set on), used primarily in the treatment of Bhangandar and Nadivrana (to explore fistulous track & sinuses). Considering the clinical utility of the latex of this plant, it was further felt essential to study the literature about its standard protocol to be considered for collection of latex of the plant. Ayurveda gives the references of Dravyasangrahankal as per Shatrituvibhajan (seasonal collection of crude drugs). It is noted that collection of kshir (latex) is done in ShradRitu (Autumn). exception to this, as per Charak Samhita Snuhikshir has to be collected from the stem of the plant which has completed 2-3 years of existence and preferably should be tapped at the end of ShishirRitu (late winter) which corresponds to mid of month of January. It is attention-grabbing to note that Acharya Charak has not only emphasized the age of the plant for the purpose of collection of latex but also the season of collection has been jotted down in great detail. This makes it clear that the morphology and physiology of plant do interact with environmental changes which in turn, do bring about changes in latex secretion of the plant. Summing up, this article gives us scientific explanation of reference of collection of Snuhikshir as given in Ayurvedic classical texts, its applied plant morphology & physiology along with its scientific way of tapping, preservation, identification, analytical details and also its therapeutic utility.

OBJECTIVES OF STUDY:
Scientific literary study related to collection of Snuhikshir in order to establish the unique concept of collection of Snuhikshir as per Charak Samhita and need of its collection only in the dawn is the primary objective of the study.

The other objectives of study were to review thorough relevant literature of Collection of Snuhikshir (Euphorbia neriifolia, Linn.) according to Ayurveda as well as Modern research in view of its tapping procedure, preservation, identification of latex on microscopy, Physicochemical analysis and its clinical usefulness.
METHODOLOGY
In this review article, information from Ayurvedic contemporary texts and websites have been documented precisely. Moreover, literature review of Rubber Plant (Hevea brasiliensis) was taken into consideration to understand the concepts of lactiferous vessels & tapping system of the plant as latex of both the plants belonging to same family of Euphorbiaceae are object of study as a potential source of hydrocarbons these days.

LITERATURE REVIEW

Dravyasangrahankal (Seasonal collection of Crude Drugs)
As we review the literature, Dravyasangrahankal according to shatrituvibhajan (seasonal collection of crude drug) has been enumerated in various classical texts. Accordingly, in Charak Samhita, it has been advocated that the branches and leaves of the plant should be collected in Varsharitu (Rainy season) & Vasant ritu (Spring), roots of the plant has to be collected in Grishmaritu (Summer) & Shishirritu (Late winter), Bark, rhizomes and latex of the plant needs to be collected in Sharadritu (Autumn), Sarabhaga (Heartwood) in Vasantritu (Spring) and fruits in Grishmaritu (Summer). From, the said references, it is interesting to note that Charak Samhita has advocated the collection of latex in Sharadritu (Autumn) whereas Sushrut Samhita has advocated its collection in Hemantritu (Early winter).

Exception of Snuhikshir
As we further explore Charak Samhita, it is noted that Acharya Charak has contradicted his words giving an exception of Snuhikshir (Latex of Euphorbia neriifolia Linn.) which has been advocated to be collected towards the end of the shishirritu (Late winter).

Significance of Age of the Plant
In order to understand the importance of plant morphology & physiology with reference to age of the plant, it is necessary to have a brief overview on the concept of cambium of the plant. Cambium is a layer of material inside a plant or tree which consists of actively dividing cells which generate growth for the plant. The vascular cambium is found inside the tissues of the plant, between the xylem and the phloem. It is responsible for the width and outward growth seen as plants mature and grow larger. In trees, it develops in distinct seasonal rings as the amount of nutrients rises and falls, and can be used as a method of dating the age of the tree, in addition to tracking weather patterns. A thin ring indicates that a tree struggled for water and nutrients, while a
thick ring illustrates ample supplies of food and water\textsuperscript{11}.

The following picture gives the arrangement of cambium tissue in Transverse Section of *Euphorbia neriifolia* Linn.

**Figure 1:** T.S. of *Euphorbia neriifolia* Linn. denoting it’s CAMBIUM

Considering this concept of Cambium; in latex bearing trees a linear relationship between the age of the tree and the number of latex vessels was found by Gomez et al. (1972). The latex vessels are reported to be concentrated in the first 4-5 mm in the virgin bark, while this concentration goes on increasing towards the cambium as the age of the tree increases\textsuperscript{12}.

**Ecoclimatic Factors governing Latex flow**

References of eco climatic factors governing latex flow and relative air humidity when studied in detail reveals the importance of collection of *Sunhikshir* (latex of *Euphorbia neriifolia* Linn.) towards the end of *Shishirritu* (Late winters). Duration of latex flow is also determined by the prevailing atmospheric humidity. The more humid the air is, the higher the turgidity of the latex containing cells and the longer it takes for latex flow to end. Thus, we can harvest more latex if the trees are tapped in the early morning hours when humidity is high and temperature is low.\textsuperscript{13,14}

**Figure 2:** Temperature & Relative Humidity Graph of India Climate
The graph (Fig.2) illustrates Climate of India which states that - In the month of January the relative air humidity is 62% and the min. temp is 7°C and max temp is 21°C whereas in spite of relative air humidity being max in the month of August i.e. 71% but the min. & max. temperature is 26 & 34 degree respectively. As stated earlier latex yield is max when relative air humidity is high and temp is low which is the optimum conditions present in the month of January i.e. Shishirritu (late winters); hence, collection of latex should be done in shishirritu (late winters) as advocated in CharakSamhita.

**Time of Collection of Latex**

Practically, it has been noted that maximum amount of Snuhikshir can be collected in the dawn. In order to comprehend this, it becomes mandatory to look into literature as regards plant physiology that is the concept of turgor pressure in plant cells and the time of collection of latex. Turgor Pressure is a force per unit area exerted outward on a plant cell wall by the water contained in the cell vacuole. In terms of plant water potential, turgor pressure is usually expressed as the pressure component ($\Psi_p$). This force gives the plant rigidity, and keeps it erect.\textsuperscript{15,16}

While studying the turgor pressure inside the laticiferous cells in Hevea, it was noted by Buttery & Boatman that, in latex bearing plants, the turgor pressure inside the laticiferous cells is directly responsible for latex flow at tapping.\textsuperscript{17}

The turgor pressure of latex vessel is maximum during the dawn, falls during the day as a result of withdrawal of water under transpiration stress and rebuilt at night. Based on Paardekooper & Sookmark, 1969 studies, the poor latex yield when the trees are tapped much after sunrise is due to such diurnal variations in turgor pressure, which in turn could be due to the changes in water vapour deficit in the air.\textsuperscript{18} Thus, immediately on tapping, the pressure in the tip of vessels is reduced to atmosphere level and this expels out of the laticifers.

Gomez in 1983, states that the serving of the latex vessels with the consequent loss of turgor pressure disturbs the original osmotic equilibrium throughout the outflow area which creates a suction pressure resulting in the influx of water from the neighboring cells into latex. At the end of the flow, the turgor pressure in the vessels is gradually restored and regeneration of latex between tapping takes place.\textsuperscript{19} As stated earlier, Snuhi (Euphorbia neriiifolia Linn.) and Rubber plant (Heveabrasiliensis) belong to the same family Euphorbiaceae, same properties are seen being exhibited by Snuhi sand hence, latex of Snuhi should be collected before dawn as recommended in CharakSamhita.

**Scientific way of Snuhikshir Tapping**

Additionally, it is important to learn the scientific way of tapping of Snuhikshir, to achieve minimum injury to the plant; for that we need to learn the concept of Tapping. Tapping means to penetrate, open up, and reach into, for the purpose of using something or drawing something off.\textsuperscript{20} Accordingly, Tapping is a process by which the latex is collected from Snuhi. Exploration of botanical aspects of La-
ticifers reveals that laticifers are specialized cell or a row of such cells that secrete the latex. Laticifers are further divided into two types Non-Articulate & Articulate. Out of these two non-articulate cells are derived from enlargement of a single cell which further elongates to form long latex tubes which are again divided into two parts viz., Unbranched Non-articulate Unbranched Lacticifer & Branched Non Articulate Branched Laticifers which are found in Euphorbia species.

Figure 3: Non Articulate Latex Cell of Euphorbia Species

As it is very much evident from fig 3, a longitudinal cut section on the Phylloclade of Snuhi not only will provides us with a larger surface area but also will allow us convenient collection of Kshir. Moreover, longitudinal cut serves an important purpose of injuring only single laticifers cells, thereby causing minimum injury to the plant during collection.

Precautions while collecting Snuhikshir
After considering the scientific way of collection of Snuhikshir as per plant botany, there is a need to understand even the precautions while collecting the same. Accordingly, reports suggest that latex produces inflammation and vesication if applied locally. It has also been reported that if latex is instilled in eyes it produces severe conjunctivitis and even eyesight is lost. Hence, people who work with Euphorbia species should wear gloves & protective glasses while handling the plant.

Preservation of Latex
Preservation of Snuhikshir is of utmost importance as it is practically seen that the latex coagulates on exposure to air. Hence, Snuhikshir preferably needs to be collected in a sterile air tight container and therefore, it is advised that fresh latex needs to be collected every time before its use as coagulated latex renders it useless for clinical utility.

However few experts transfer the collected latex in the jar containing Diethyl ether (CH₃-0-CH₂CH₃), ether being an inert substance with good solvent properties for organic molecules. Moreover, ethers are used as a General anesthetic agent, refrigerant as produces cooling on evaporation and used as a solvent for oils, fats, resins etc. and is also highly inflammable. It has been observed that, ether prevents coagulation of latex and hence, latex can be preserved for some days for its clinical utility.

Microscopy & Identification of Snuhikshir
Natural latex is a milky sap found in 10% of angiosperms. It is a complex emulsion consisting of proteins, alkaloids, starches, sugars, oils, tannins, resins, and gums that coagulates on exposure to air, mainly serving as a defense
against herbivorous insects.\textsuperscript{25} Latex of Euphorbia species can be distinctively identified from latexes of other plants by the microscopy of Latex which exhibits starch grain pattern. As per the literary review, the latex of \textit{Euphor bianeriifolia Linn}. exhibits, characteristic dumb-bell shaped structure of starch grain.\textsuperscript{26}

\textbf{Figure 4:} Dumbell Shaped Starch Grain Pattern on Microscopy of Latex of \textit{Euphorbia Neriifolia Linn.}

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|}
\hline
\textbf{Sr.No.} & \textbf{PARAMETER} & \textbf{SNUHIKSHIR \% w/w} \\
\hline
1. & Moisture Content & 16.90\% \\
2. & Total Ash value & 0.50\% \\
3. & Acid insoluble Ash & 1.5\% \\
4. & Water soluble Ash & 1.0\% \\
5. & Water soluble extractive & 11.2\% \\
6. & Alcohol soluble extractive & 15.2\% \\
7. & pH & 4.96 \\
\hline
\end{tabular}
\caption{Illustrating Analytical data of \textit{Snuhikshir} (Latex of \textit{Euphorbia neriifolia Linn.})}
\end{table}

As literary review of \textit{Snuhikshir} is explored for its clinical utility, we get many references of its therapeutic uses internally as well as locally. Acharya Chakradatta while describing local application for conservative management of \textit{Arsha} (Haemorrhoids), has advocated to apply turmeric powder mixed with \textit{Snuhikshir}.\textsuperscript{28}

Further, Acharya Chakradatta has mentioned the preparation of ‘\textit{Ksharasutra}’, medicated
seton useful to treat piles and fistula, by using latex of *Snuhi* and Turmeric powder.\(^{29}\)

In the classical Ayurvedic texts, Yogratinakar, *Snuhikshir* is one of the important content for formulation of *JalodaradiRas* used in Ascites.\(^{30}\)

Bhaishajyaratnavalli, classical text of Ayurveda, mentions *Snuhikshir* as one of the important ingredient in *ArshakutharRas* which is indicated in Piles.\(^{31}\)

Acharya Chakradatta has also mentioned use of *Snuhikshir* in preparation of Jataydivarti, wick locally used for sinuses.\(^{32}\)

**DISCUSSION**

Charak Samhita has strongly advocated the collection of *Snuhikshir* towards the end of *Shishirritu* which approximately corresponds to the mid of month of January; since the yield of latex during this month is high; the reason being, we can harvest more latex if the plant is tapped in the early morning hours when humidity is high and temperature is low in late winters.

As regarding the importance of age of the plant which has been mentioned as 2-3 years in Charak Samhita; it is rightly ascertained that in latex bearing trees a linear relationship exist between the age of the tree and the number of latex vessels. The latex vessels are reported to be concentrated in the first 4-5 mm in the virgin bark, while this concentration goes on increasing towards the cambium as the age of the tree increases.

To cause minimum injury to the stem, linear longitudinal cuts should be taken while collection of latex. Moreover, special care needs to be taken by wearing gloves and glasses to avoid contact injury.

*Snuhikshir* can be differentiated from other latexes with the presence of dumbbell shaped starch grain pattern on microscopy. Analytical study on *Snuhikshir* revealed that latex is a weak acid with pH 4.96.

**CONCLUSION**

It is very much evident from the present literary review that for the purpose of Clinical utility of *Snuhikshir*, Acharya Charak has not only incorporated the importance of plant morphology & Physiology but also has given prime importance for the time of collection of latex with thorough understanding of the eco climatic effects on the plant. Hence, in order to achieve the desired amount and exact potential of *Snuhikshir* guidelines given in Charak Samhita needs to be followed thoroughly.

Furthermore, scientific way of collection of *Snuhikshir* allows one to understand the collection of kshir with minimum injury to the plant; identification of microscopy of its characteristic dumbbell shaped starch grain pattern allows one to understand pharmacognostical aspect of *Snuhikshir* to differentiate it from other latexes; also the Physico chemical parameters of *Snuhikshir* which were previously not studied as per Ayurvedic pharmacopoeia of India was ascertained for a complete comprehensive review of *Snuhikshir* which will be helpful for further studies.

**REFERENCES**

1. Dr. Jharkhande Ozha & Dr.Umapati Mishra, commentators, , Dhanwantari
17. P.M. Priyadarshan, Biology of Hevea Rubber, Chapter 4, pg 56 [cited 2017 May 10]
27. The Ayurvedic Pharmacopoeia of India, Part I, Volume 1,p.134
30. Vaidya Shrilakshmpatishastri, Commentator, Yogratnakar Vidyotinitika, Uttaradha Udarchikitsa, 8th ed., 2004, Varanasi : Chaukhamba Sanskrut Sansthan, p.120

Source of Support: Nil
Conflict Of Interest: None Declared