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

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ABSTRACT

Snuhikshir (latex of *EuphorbianeriifoliaLinn*. 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 neriifolia-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 neriifolia Linn., Dravyasangrahankal, ksharsutra*

INTRODUCTION

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[1].The classical textbook of Ayurveda Pharmaceutics and Indian Alchemy, *Rastarangini*, has mentioned *Snuhikshir* (latex of *EuphorbiaNerfolialinn.* under *UpvishaVarga* (category of sub poisons)[2]. 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*[3] (Included in 6 important trees used for detoxification of body) and has compiled a separate chapter in Charak Samhita[4] thereby, introducing the importance of the drug for *tikshnavirechanupakram* (purgative activity)[5].

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 *SharadRitu* (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[10].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 (*Heveabrasiliensis*) .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)[6] & *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 *Hemantritu* (Early Winter) whereas Flowers and Fruits needs to be collected in respective *ritu.* (season)[7].

Further, Commentator of Charak Samhita, Acharya Chakrapanidatta cleared that, root of medicinal plant with *Ushnaveerya* (plants possessing hot potency) should be collected in *Grishmaritu* (Summer) and with *Sheetaveerya* (plants possessing cold potency) should be collected in *Shishirritu.*(Late winter)[8].

As per Sushrut Samhita, root of the plant needs to be collected in *Pravrutaritu* (before rainy season), leaves in *Varsharitu* (rainy season), bark of the tree in *Sharadritu* (Autumn), latex in *Hemantritu* (Early winter), *Sarabhaga* (Heartwood) in *Vasantritu* (Spring) and fruits in *Grishmaritu* (Summer)[9]. 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). [10].

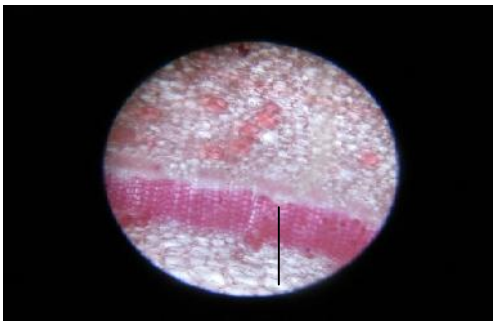
Significance of Age of the Plant

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[11].

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

Figure 1: T.S. of *Euphorbia neriifoliaLinn*. enoting it's CAMBIUM

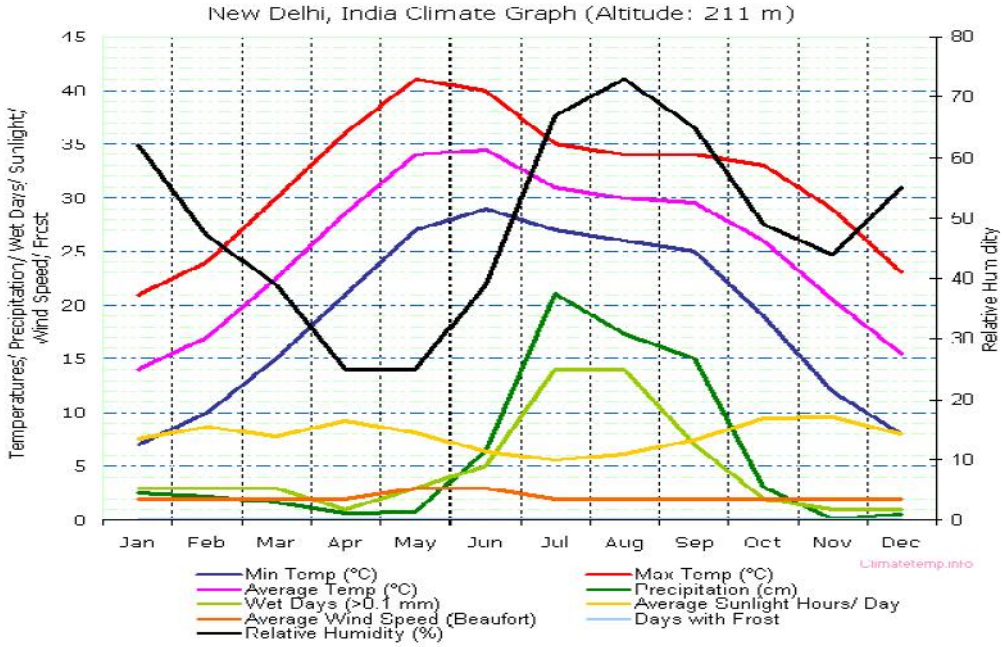


Considering this concept of Cambium; in latex bearing trees a linear relationship between the age of the tree and the number of latex vessels was found by Gomez et al. (1972). The latex vessels are reported to be concentrated in the first 4-5 mm in the virgin bark, while this concentration goes on increasing towards the cambium as the age of the tree increases[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. [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.[14]

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 (Ψ_p). This force gives the plant rigidity, and keeps it erect.[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.[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.[18]Thus, immediately on tapping, the pressure in the tip of vessels is reduced to atmosphere level and this expels out of the laticifers.

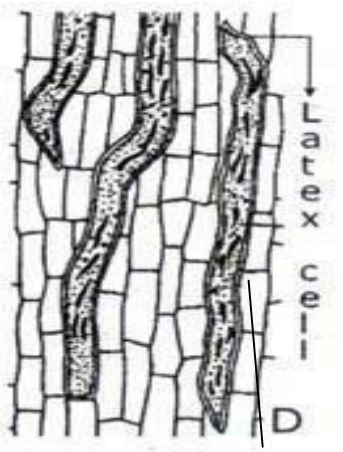
Gomez in 1983, states that the serving of the latex vessels with the consequent loss of turgor pressure disturbs the original osmotic equilibrium throughout the outflow area which creates a suction pressure resulting in the influx of water from the neighboring cells into latex. At the end of the flow, the turgor pressure in the vessels is gradually restored and regeneration of latex between tapping takes place[19].As stated earlier, *Snuhi* (*Euphorbia neriifolia Linn.*) and Rubber plant (*Heveabrasiliensis*) belong to the same family Euphorbiaceae, same properties are seen being exhibited by *Snuhi s*and 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[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. [21]

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.[22]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.

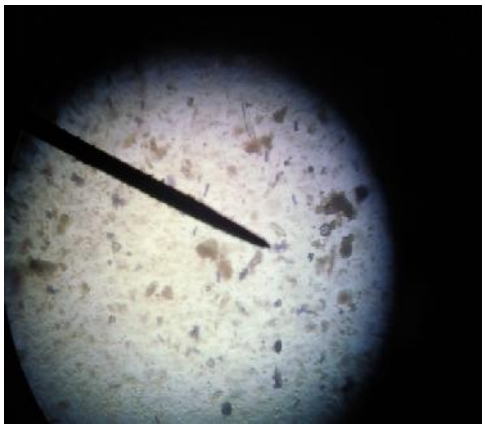
However few experts transfer the collected latex in the jar containing Diethyl ether (CH_3-0-CH_2CH_3), ether being an inert substance with good solvent properties for organic molecules[23]. Moreover, ethers are used as a General anesthetic agent, refrigerant as produces cooling on evaporation and used as a solvent for oils, fats, resins etc. and is also highly inflammable.[24] 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 herbivorousinsects.[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 *EuphorbianeriifoliaLinn*.exhibits, characteristic dumb-bell shaped structure of starch grain.[26]

Figure 4: Dumbell Shaped Starch Grain Pattern on Microscopy of Latex of *Euphorbia Neriifolia Linn.*



Analytical Data of *Snuhikshir*

After the microscopic evaluation of *Snuhikshir*, literary search was carried out in view of its Physico-chemical parameters. Ayurvedic pharmacopoeia of India gives us detailed information about the stem of *Snuhi* but no information was found about the latex.[27]Hence, analytical study was carried out on the latex of *Euphorbia neriifolia Linn.* which is illustrated in the given tabular format.

Table 1: Illustrating Analytical data of *Snuhikshir* (Latex of *Euphorbia neriifolia Linn.*)
Clinical Utility of *Snuhikshir*

Sr.No.	PARAMETER	SNUHIKSHIR % w/w
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

As literary review of *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 *Arsha* (Haemorrhoids), has advocated to apply turmeric powder mixed with *Snuhikshir*.[28]

Further, Acharya Chakradatta has mentioned the preparation of '*Ksharasutra'*, medicated

seton useful to treat piles and fistula, by using latex of *Snuhi* and Turmeric powder.[29]

In the classical Ayurvedic texts, Yogratnakar, *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 Jatyadivarti, 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.

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