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PHARMACEUTICAL STANDARDIZATION OF *RASANJANA*: A COMPREHENSIVE STUDY ON *DARUHARIDRA*-BASED *RASAKRIYA* PREPARATION

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ABSTRACT

Ayurvedic pharmaceutics plays a pivotal role in the systematic preparation of medicines adhering to Ayurvedic principles. This study focuses on *Rasanjana*, a unique rasakriya prepared from Daruharidra (*Berberis aristata*), renowned for its broad-spectrum utility in treating various ailments. **Aims & Objectives**: The primary aim of this study is to standardize the manufacturing procedure of *Rasanjana*, with a focus on the critical aspects of preparation. **Materials & Methods**: The pharmaceutical procedure involved the preparation of *Daruharidra Kwatha*, mixing *Aja Ksheera* to *kwatha*, and ultimately preparing *Rasanjana*. The study was preceded by multiple pilot studies, and the observations and critical factors were incorporated into the standard pharmaceutical procedure followed in this study. **Results**: *Rasanjana*, derived from 1.5kg *Daruharidra*, underwent an 8.5-hour process, yielding 520g. The preparation involved a *Kwatha* reduction to 3 litres, addition of 3 litres *Aja Ksheera*, resulting in brownish-yellow, bitter-tasting granules with a pleasant smell and unctuous touch. **Discussion**:

The discussion delves into the challenges encountered during the pilot studies. The study emphasizes the importance of vessel selection, temperature control, and purification steps in ensuring the success of the preparation process. **Conclusion**: The research concludes with a comprehensive understanding of the factors influencing the quality and potency of *Rasanjana*. The choice of *Daruharidra*, the precise extraction techniques, and the interaction with *Aja Ksheera* contribute to the final product's efficacy. The study highlights the significance of attention to detail, ensuring the integrity of the pharmaceutical preparation.

KEYWORDS: *Aja-ksheera*, vessel selection, temperature control, extraction techniques, granules.

INTRODUCTION

In Ayurveda, the foundation of effective treatment rests on four essential components, collectively known as *Chikitsa chatushpada* or the Four Pillars of Treatment.[1] Among these, *Bhishak*, the doctor, takes precedence, with *Dravya*, representing the drug, formulation, or therapeutic agent, following closely. The pivotal role of Ayurvedic pharmaceutics comes into play during the crucial steps of procuring the right drugs and employing appropriate processing techniques to transform them into the desired medicinal form. These procedures highlight the intricate and systematic methods integral to the preparation of medicines aligned with Ayurvedic principles.

Rasakriya is a unique form of preparation in *Bhaishajya Kalpana*. It is also used as a synonym to *avaleha*.[2] According to *Sharngadhara Samhita*, *Rasakriya* typically denotes a liquid preparation which is reheated to obtain a product of thicker consistency.[3] This closely mirrors the contemporary process of preparation of drug extractives. In *Charaka Samhita*, in the chapter *Arsha Chikitsa adhyaya*, there is a description of *Kutajadi rasakriya*, wherein the method of *Rasakriya* preparation is also elaborated. This *rasakriya* is said to address bleeding in *Arshas* if administered in appropriate dose and time.[4] In *Sushrutha Samhita*, in *Mishraka adhyaya*, the different forms of external applications for treating *vrana* have been explained under which *Shodhani rasakriya* is mentioned. It is to be prepared from *Salasaradi, patoladi gana dravyas* and *triphala* and is said to be useful for *vrana shodhana*. It is in this context that Acharya Dalhana comments about *Rasakriya* and elaborates on its general method of preparation.[5] To prepare *rasakriya* one part of the drug with either 8 or 16 parts of water is added and boiled over mild fire until 1/8th or 1/16th part of the liquid remains. Later it is

filtered through a clean cloth. The filtrate is further boiled and reduced to a thicker consistency as that of *phanita* which will have the consistency of honey.

Rasanjana, is the *rasakriya* prepared from *Daruharidra*, which is identified botanically as *Berberis aristata*. It is commonly called as *Rasont* or *Rasaunt*. In *Charaka Samhita* it is mentioned in various chapters, as a drug useful in the management of *Kushta*, *Rakta arshas*, *Pittaja Grahani*, *Kasa*, *Atisara*, *Visha*, *Gala roga*, *Karna shoola*, *netra roga*, *yoni dosha*. It is mentioned both for internal administration as well as external applications, and is used in various dosage forms through various routes of administration such as *Anjana*, *Basti* etc. We find two references of *Rasanjana*, wherein *Daruharidra kwatha* is prepared, followed by addition of milk and further reheating until 1/4th reduction or till a semi-solid consistency is attained. The only difference being that *Bhavaprakasha* enlists the addition of equal quantity of *Go-ksheera* while *Ayurveda prakasha* advocates the usage of *Aja-ksheera*.[6,7] Considering the wide applicability and broad-spectrum utility of *Rasanjana*, its pharmaceutical preparation and standardisation was attempted in this study.

AIMS AND OBJECTIVES

This study was aimed at standardising the manufacturing procedure of *Rasanjana*, i.e., *Daruharidra rasakriya.*

MATERIALS AND METHODS

The *Daruharidra* raw drug was procured from local Ayurveda drug vendor and goat milk was obtained from authentic farm produce supplier. All the ingredients were then authenticated by subject experts at the SDM College of Ayurveda, Udupi.

Equipment used: Stainless steel vessel (of about 14 litres capacity), stainless steel vessel (of 3-4 litre capacity), stainless steel ladle of arm's length, steel spoon, measuring jar, sieve (10#), weighing machine, pulverizer, grinder, gas burner with LPG cylinder were used.

Table 1: Ingredients of Rasanjana.

1. *Daruharidra*	1.5 kg
2. Water	8 parts of water (12 litres) (Reduced to ¼th = 3l)
3. Goats milk	equal to kwatha (3 litres)

Reference: *Ayurveda Prakasha*[6], *Bhavaprakasha*[7]

Principle involved: Extraction – Decoction, and concentration.

Pharmaceutical Procedure

Rasanjana was prepared in the practical hall of Dept. of Rasa Shastra & Bhaishajya Kalpana, SDMCA, Udupi. The steps involved in its preparation are as follows.

a. Preparation of *Daruharidra Kwatha*: *Daruharidra* was taken, thoroughly cleaned and dried. It was then made into coarse powder using a pulverizer. The coarse powder of *Daruharidra* was then placed in a stainless-steel vessel and soaked with water just enough to immerse it and left over night. The next day, 8 parts of water was added to it and boiled over moderate fire using a gas stove. After reduction to 1/4th of the original volume, the *Kwatha* was filtered through a sieve into a separate container and the residue was discarded.

b. Mixing of *Aja Ksheera* to *kwatha*: *Aja Ksheera* (Goats milk) procured from a reliable source was taken in another fresh vessel and heated up to its boiling. The *Aja Ksheera* was then added to the already prepared and filtered *Daruharidra kwatha*. This mixture was then further heated on mild fire with constant stirring. As the water content evaporates and liquid starts getting thicker and attains syrupy consistency, the stirring was done more vigorously to avoid sticking of the contents to the vessel.

c. Preparing *Rasanjana*: The thick syrup-like material obtained was then transferred to a smaller vessel and further heating was carried out using a water bath to avoid charring. After complete evaporation of water content, the product was similar to *leha* and the heating was then stopped. The product was left in the same vessel for self-cooling. Due to temperature of the heated vessel, the *leha* like mass attained a solid form like that of granule. After complete cooling, the product was properly dried, then grinded and sieved to obtain the fine powder form of *Rasanjana*, which was then stored in air-tight containers.

RESULTS

Observation

Since the quantity of *Daruharidra* was more (1.5kg) and as it is a hard drug and difficult to pound manually, the procedure required the use of a pulverizer to make the drug into coarse powder. On soaking the drug in water, the colour of water becomes light yellow. On boiling the drug with water its colour changes to brown and the thus obtained *kwatha* was dark drown in colour with a characteristic smell. *Kwatha* preparation took about 8.5 hours of time. After adding *Aja Ksheera* to the *kwatha* and boiling it, the colour changed to creamy yellow and it had a pleasant aroma. On further boiling, the mixture began to attain a semi-solid

syrupy consistency with a pleasant smell like that of milk khoya. When the vessel was removed from direct heating and switched to indirect heat via a water bath, the evaporation of water content from *Rasanjana* slowed down. On heating it further, the stirring became difficult as a thick leha consistency was observed. When heating was stopped and the product was allowed to remain in the vessel further on, *Rasanjana* changed from thick leha consistency into granule form. The *Rasanjana* granules were brownish yellow in colour, slightly unctuous to touch and had a characteristic smell.

Precautions

Daruharidra is a hard drug and even while using a pulverizer, the drug is introduced little by little to avoid damage to the rotating blades of pulverizer. Soaking of *Daruharidra kwatha churna* in water overnight prior to *kwatha* preparation is essential for better extraction. The *kwatha* preparation is carried out in *madyamagni* and *rasakriya* preparation in *mandagni* for efficient preparation of *Rasanjana*. While filtering the *kwatha*, the residue is not squeezed as it may result in the release of unwanted starchy material from the *kwatha churna* into the *kwatha*. The *Aja Ksheera* is boiled once before adding to the *Daruharidra kwatha*. The two liquids being mixed must be having around the same temperature while mixing them. The vessels used for boiling the *Aja Ksheera* and *Daruharidra kwatha mixture* must be a new vessel or a vessel which is not used for heating/storing any *amla katu rasa dravyas* priorly. If at all this is not followed, upon boiling the *Aja Ksheera* and *darvi kwatha* mixture, the *Aja Ksheera* curdles and a curdled layer of cream separates on top, spoiling the product and halting the procedure. As the product thickens, the stirring must be done continuously to avoid sticking and charring of the product. When a dense *leha* like consistency is obtained, direct heating is discontinued to avoid charring. Once *Rasanjana* is obtained in powder form it must be dried properly and then stored in air tight containers to prevent spoilage as it is prepared from milk and prone for spoilage if it retains moisture content. The *Rasanjana* can also be stored in refrigerator to preserve it for longer periods and avoid exposure to external contaminants/ varying weather conditions.

Note: Several pilot studies were conducted to establish a standard operating procedure for preparing *Rasanjana*. In many pilot studies, upon adding Aja Ksheera to Daruharidra kwatha, the milk would get curdled and the product would get spoilt immediately. Mixing temperatures and vessels used for procedure were strictly monitored to obtain the proper product of Rasanjana. Rasanjana was also prepared without adding milk, just as Daruharidra

Ghana, to identify and confirm the critical control points in this preparation. The final procedure followed and precautions listed above are the result of resolving the complexities and problems faced during the pilot studies.

Table 2: Results of *Rasanjana* preparation.

Weight of *Daruharidra* taken	1.5kg
Quantity of water taken (8 parts)	12 litres
Time taken for reduction	8.5 hours
Quantity of *Kwatha* obtained	3 litres
Quantity of *Aja Ksheera* added	3 litres
Quantity of *Rasanjana* obtained	520g

Table 3: Organoleptic characteristics of *Rasanjana.*

Appearance	Granules
Colour	Brownish yellow
Taste	Bitter
Smell	Pleasant smell
Touch	Unctuous

Preparation of Rasanjana – pilot studies

Fig 1: Procuring of raw drugs – daruharidra.

Fig 2: Darvi Kwatha preparation

Fig 3: Completion of Darvi Kwatha

Fig 4: Curdling of Kwatha on adding of milk.

Fig 5: Daruharidra ghana as pilot study

Fig 6: Rasanjana obtained after implementing corrections.

Preparation of *Rasanjana*

Fig 7: Soaking of *Daruharidra kwatha churna.*

Fig 8: *Kwatha* preparation

Fig 9: Filtering *Kwatha*

Fig 10: Adding *Ajaksheera* to *kwatha*

Fig 11: Reduction in volume of *kwatha-ajaksheera* mixture

Fig 12: *Rasanjana* obtained in leha consistency.

Fig 13: *Rasanjana* obtained in granule form.

DISCUSSION

Derived from *Daruharidra*, Rasanjana is a type of rasakriya of *Daruharidra kwatha* with the addition of cow's milk/goat's milk. The term "*Rasanjana*" refers to its profound benefits for eye disorders, although diverse applications are highlighted across various Ayurvedic texts. Notably, different authors like Bhava Mishra and Rasa Madhava slightly vary the preparation technique, emphasizing the usage of cow's milk or goat's milk. *Aja Ksheera* has *raktapitta shamaka* and *rakta sangrahika* properties while Go ksheera has vatapitta shamaka and brimhana properties.

Daruharidra, the pivotal ingredient, undergoes extraction within an aqueous medium. The resulting extract is then subjected to controlled evaporation, gradually concentrating its essence, and subsequently subjected to the addition of *Ajaksheera,* further followed by a phase of concentration until the entire mixture is evaporated, ultimately yielding the solid form of *Rasanjana.*

Although the procedure is clearly chalked out, through an initial series of pilot studies, a perplexing occurrence was observed - the interaction between *Aja Ksheera* and *Daruharidra kwatha* consistently led to curdling and spoilage. After extensive experimentation and adaptations, a significant realization emerged. It became evident that the vessel employed in the preparation process had previously been used for various pharmaceutical experiments, potentially exposing it to *amla* and *katu rasas*, among other substances. This revelation resonates with a principle deeply rooted in everyday wisdom. Common practice dictates the allocation of a dedicated vessel solely for milk storage and processing, shielding it from contact with other food items, especially *amla* and *katu rasa dravyas*. This prudent practice effectively averts contamination, fermentation, and spoilage, thus preserving the integrity of milk. Armed with this understanding, the procedure was repeated in new stainless-steel vessel, resulting in the successful completion of *Rasanjana* preparation.

To begin with, *Daruharidra* processing started off with its cleaning and drying. To facilitate efficient extraction, the dried *Daruharidra* was converted into a coarse powder using a pulverizer. This step enables optimum contact between the plant material and the solvent (water). Soaking the coarse powder in water overnight aids in softening the drug and enhances the extraction of its active constituents. Then process involved adding of *Ajaksheera* to the prepared *kwatha*. *Aja Ksheera* was taken and separately heated to boil, and then added to the *kwatha.* This mixture was further subjected to controlled heating while maintaining constant stirring which prevents sticking and charring of the contents. The subsequent evaporation of water content led to the formation of a thick syrup-like liquid, after which the contents were transferred into a smaller vessel and a water bath was employed to ensure a steady heating process. The product's consistency then changed from a thick liquid to *leha* consistency, which then turned to granule form.

CONCLUSION

The choice of *Daruharidra*, the extraction techniques, and the interaction with *Aja Ksheera* all contribute to the final product's quality and potency. The use of *Aja Ksheera*, with its unique characteristics pertaining to *Raktapitta shamana*, brings a complementary aspect to the formulation. Careful consideration of various factors, such as temperature, mixing, and purification, play important roles. Furthermore, the attention to detail in terms of vessel selection, the timing of adding ingredients, and the utilization of water baths ensure the integrity and efficacy of the final *Rasanjana* product.

Conflicts of interest: There are no conflicts of interest.

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