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COMPARATIVE PHARMACEUTICO-ANALYTICAL STUDY OF VACHA GHRITA AND AVARTITA VACHA GHRITA

Dr. Chaitra D. C[1*], Dr. Seema M. B.[2] and Dr. Surekha S. Medikeri[3]

[1]Final Year PG Scholar, Dept. of PG and PhD Studies in Rasashastra and Bhaishajya Kalpana, Government Ayurveda Medical College, Bangalore.

[2]Professor Dept. of PG and PhD Studies in Rasashastra and Bhaishajya Kalpana, Government Ayurveda Medical College, Bangalore.

[3]HOD and Principal Dept. of PG and PhD Studies in Rasashastra and Bhaishajya Kalpana, Government Ayurveda Medical College, Bangalore.

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***Corresponding Author**
Dr. Chaitra D. C.
Final Year PG Scholar, Dept. of PG and PhD Studies in Rasashastra and Bhaishajya Kalpana, Government Ayurveda Medical College, Bangalore.

ABSTRACT

Background and Objective: *Avartana* is a unique concept in *Ayurveda* pharmaceutics mentioned for *Sneha Kalpana*. It's a key to obtain a concentrated and more potent formulation, with repeated processing. *Avartita Vacha Ghrita (AVG)*, is a formulation mentioned in *Sushrutha Samhita*, *Medhayushkamiya Chikitsa*. This formulation was selected and subjected to a total of 21 *Avartanas*. Pharmaceutico-Analytical study was performed to compare the Physicochemical changes occuring in successive *AVG* samples, specifically the 1st, 5th, 10th, 15th, 20th and 21st samples. Quantitative estimation of a therapeutically potent phytoconstituent, Beta Asarone, of the drug *Vacha*, was estimated, in the above samples. **Methods:** 21st *Avartita Vacha Ghrita* was prepared, the above samples were subjected to Physicochemical and Instrumental analysis. **Results:** During Pharmaceutical process, no much Organoleptic changes were observed on successive *avartana*, except the consistency of *Kalka* in the later cycles. As per Physicochemical analysis, on successive *Avartana*, gradual increase in Refractive index, Specific gravity, Iodine value, Acid value, a notable increase in Saponification value, a slight decrease in pH were observed. The concentration of Beta Asarone significantly increased in successive *Avartana*. **Conclusion:** The study

indicates significant increase in the solubilization of active phytoconstituents on successive *Avartana*.

KEYWORDS: *Avartana, Avartita Vacha Ghrita (AVG),* Physicochemical analysis.

INTRODUCTION

For the success of an *Ayurveda* doctor, one of the factors is his choice of dosage forms as medicine. Not all dosage forms are suitable in all conditions.[1] *Sneha Kalpana* is one such dosage form which holds considerable Pharmaceutic and Therapeutic importance. *Sneha Kalpana* may be defined as "A pharmaceutical process to prepare oleaginous medicaments from *Sneha, Kalka & Drava dravyas*, in their prescribed ratios, by subjecting to heating procedure as per certain pharmaceutical parameters."[2] In this, a notable aspect is the incorporation of both Water soluble and Lipid soluble constituents.[3] It significantly enhances the permeability of drugs, even through the Blood Brain Barrier,[4] owing to its lipophilic nature. Hence it is an efficient Lipid-based drug delivery system.

Avartana of *Sneha* is a special concept mentioned in the *Samhita*. The term '*Avartana*' refers to '*Vrutu Vartane*',[5] repetition, completion of a cycle.[6] In the context of *Sneha Kalpana*, *Avartana* refers to repetition of process of *Sneha Paka*. References of various *Dashapaka, Shatapaka, Sahasrapaka tailas and ghritas* are mentioned in classics, indicating the number of times of *Sneha paka* repeated. *Avartana* is done to increase potency *(Veeryabalaadanartha)* of *Sneha.*[7] In the present era, *Avartana* holds an immense significance of delivering a final product with enhanced potency. The more the number of *Avartana*, the more potent may be the formulation. *Avartita Kalpana* may exhibit rapid action, improved therapeutic efficacy at lower doses, and be easy for administration and packaging.

Ghrita is considered *Sarvasnehottama,*[8] superior among the 4 types of *Snehas*, as it possesses the special quality of '*Samskarasya Anuvartanat,*[9] retaining its inherent properties while imbibing those of the drugs used along with it in processing. It enhances attributes like *Smriti, Buddhi, Agni, Ojas.*[10] *Ghrita* does *Medhya and Rasayana Karma.*[11] *Avartita Ghritas* are mentioned in the context of *Rasayana* in the classics, as in, *Pranakamiya Rasayana* of *Charaka samhita,*[12] *Medhayushkamiya* and *Sarvopaghatashamaniya Rasayana* in *Sushrutha Samhita*[13] *Avartita Vacha Ghrita* is one such formulation, explained in *Sushruta Samhita Medhayushkamiya chikitsa.*[14] *Vacha*, also a *Rasayana Dravya*, does *Medhya Karma*,

enhances *Smriti*, is *Vakswaraprada*.[15] Hence, taking the aforementioned into account, *Avartana* of *Ghrita* along with *Vacha* may deliver *Medhya* and *Rasayana Karma* more efficiently, in lower doses.

In the present Research era, it is important to understand the pharmaceutical significance of the *Avartana* process and analyse the associated physicochemical transformations.

MATERIALS AND METHODS

Go Ghrita was collected from PVKR and Co, Bengaluru. Raw Drug *Vacha* was collected from Kajre Pharmacy, Belgaum. Physicochemical analysis was carried out at Drug Testing Laboratory, Bengaluru.

Pharmaceutical study

Vacha Ghrita was prepared as per the reference of *Sushruta Samhita*.[14] The ratio of ingredients was taken on the basis of *Anukta Mana* mentioned in *Sharangadhara Samhita*.[2]

Table 1: Ingredients of 1st Avartita vacha ghrita.

Ingredients	Proportion	Quantity taken
Go Ghrita	1 part	7 litres
Vacha Kalka	1/4 part of Ghrita	1750 g
Jala	4 Parts of Ghrita	28 litres

Procedure of 1st avartana: The measured *Ghrita* was poured into a wide mouthed vessel, placed on the stove and ignited over *Mandagni* (Mild flame). *Vacha Kalka* (Paste) and *Jala* were added to this, the mixture was stirred and boiled. The *Ghrita Paka* was carried out until *Mridu Paka Lakshanas* were obtained.[16] The duration of this *Paka* was 3 days. The prepared 1st *AVG* was bright yellow, granular viscous in consistency, possessed the characteristic smell of *Vacha* and was *Tikta, Kashaya Rasa* in taste.

Table – Total quantity of Ingredients used in the whole preparation of 21 *Avartita Vacha Ghrita.*

Ingredients	Quantity
Go Ghrita	7000 ml (7 Litres)
Vacha Kalka	19903 g (19.9 kg)
Jala	328802 ml (328 litres 802 ml)

Common Procedure of 2nd to 21st *avartita vacha ghrita*

The obtained 1st *AVG* is taken along with *Vacha Kalka* and *Jala* in the *Anukta Mana*. *Ghrita Paka* is carried out in a similar manner. The filtered *Ghrita* is then used for the next *avartana* procedure. This process is repeated 21 times to obtain the 21st *AVG* as the final product. During the 1st to the 20th *avartana*, the *Ghrita* is filtered at its *Mridu Paka* stage.[16] However, in the 21st *avartana*, the final product is obtained in its *Madhyama Paka* stage, when *Sneha Siddhi Lakshanas* are achieved.

Table 4: Observations during different *avarti* preparations of *vacha ghrita.*

Avarti preparation	No.of Days	Total time taken for Paka	*Ghrita* (ml)	*Kalka* (g)	*Jala* (ml)	*Ghrita* obtained (ml)	*Kalka* obtained (g)	*Loss in Ghrita* (ml & %)
1st *Avarti*	3 Days	20 Hrs	7000	1750	28000	6600	1605	400 ml, 5.71 %
5th *Avarti*	2 Days	9 Hrs 30 min	5204	1301	20816	4830	1124	374 ml, 7.18 %
10th *Avarti*	2 Days	7 Hrs 30 min	3700	925	14800	3610	928	90 ml, 2.43 %
15th *Avarti*	2 Days	6 Hrs 45 min	2700	675	10800	2610	660	90 ml, 3.33 %
20th *Avarti*	2 Days	6 Hrs	1820	455	7280	1700	705	120 ml, 6.59 %
21st *Avarti*	2 Days	6 Hrs 20 min	1640	410	6560	1500	650	140 ml, 8.53 %

On progressive *Avartana*, the Bitter taste of *Vacha* increased. Colour of the *Ghrita* was found to be same. The characteristic smell of *Vacha* was present in all samples.

Analytical study[17]

Physicochemical analysis was carried out for 1st, 5th, 10th, 15th, 20th and 21st *Avartita Vacha Ghrita* Samples.

RESULTS

Table 5: Physicochemical Results of *Avartita Vacha Ghrita (AVG)* Samples.

Samples	Refractive index	pH value	Specific gravity	Saponification value	Iodine value	Acid value	Rancidity
1st AVG	1.4539	6.19	0.916	214.35	30.289	1.22	Not Rancid
5th AVG	1.4550	6.13	0.932	208.49	30.846	1.34	Not Rancid
10th AVG	1.4558	6.15	0.937	221.82	32.458	1.77	Not Rancid
15th AVG	1.4562	5.78	0.959	228.18	34.868	2.95	Not Rancid
20th AVG	1.4571	5.69	0.972	240.99	35.311	3.11	Not Rancid
21st AVG	1.4574	5.67	0.974	241.38	35.661	3.67	Not Rancid

In the successive samples, there was a slight increase in the Refractive index, Specific Gravity, Iodine value, Acid value. A notable increase was observed in the Saponification value. A mild decrease was seen in the pH value. All the samples passed the Rancidity test.

DISCUSSION

The concept of *Avartana* is of paramount significance in Ayurveda. *Avartana* does *Veeryabalaadanartha* (Increases potency) of *Sneha*.[7] In the preparation of *Avartita Sneha*, there is a process of repeated addition of medicinal substances along with repeated exposure to heat (*Agni samskara*). *Avartana* may change the molecular structure of the end product.[18] This may result in a concentrated final product that possesses high potency and enhanced bioavailability. Consequently, it may enhance absorption at the cellular level. During the Pharmaceutical process of *Sneha Kalpana*, Active botanical ingredients (ABIs) of the herbs are absorbed into the lipid base. ABIs are proven to be polar, do not directly dissolve in non polar media, ruling out the possibility of a self emulsifying system. Hypothetically, ABIs may be distributed with the lipid base in the form of confined encapsulating structures of micro to nano size particles. Since the confined structures are in nano size, they easily penetrate the biological barriers and remain in the circulatory system, to deliver the polar active subtances over a prolonged period of time.[19] Therefore this *avartita Sneha*, carrying the soluble parts of the ingredients, has the ability to penetrate Blood-CSF barrier in minute doses, where the entry of non lipid soluble drugs is limited. *Shatapaka Vacha Ghrita* is a formulation explained in *Sushrutha Samhita* in *Medhayushkamiya Chikitsa* for *Vyadhiharana* and *Rasayana*.[14] As per experts' guidance, due to immense loss of *Ghrita* after each paka, 21st *Avartita Vacha Ghrita* was chosen as the final end product for this comparative analytical study.

During the Pharmaceutical study, the initial quantity of *Ghrita* taken was 7 Litres. After 21st *paka*, *ghrita* was 1 litre 640ml. The loss in *Ghrita* after each *Avartana* may be due to loss due to transfer of *ghrita* from one vessel to another and due to absorption of some amount of ghrita by kalka (paste) each time. On 4th *Avartana* onwards, the *Kalka* started to form as clusters or clumps during the completion stage of *Ghrita*. The concentration of herbal components in the *ghrita* could have increased in repeated cycles, leading to the thickening of the mixture and clumping or clustering. There were not much Organoleptic changes observed on successive *Avartana*, except the increase in *Tikta Rasa*/ Bitter taste.

Physicochemical parameters can be assessed from two perspectives, one focusing on the Shelf life, which holds pharmaceutical significance and the other focusing on the Biological aspects, that holds therapeutic importance. The analytical study revealed a mild increase in the Refractive index (R.I), on successive avartana, due to an increase in density of *Ghrita*, which may be due to an increase in concentration of phytoconstituents in it. The pH values, on successive *avartana*, have slightly decreased. The pH ranged from 6.19 to 5.67 from 1st to 21st *AVG* Sample, indicating an increasing acidic nature. A minor drop in pH can be beneficial for preserving certain medicinal properties.[20] Mild acidity helps in preserving the *ghrita* by inhibiting microbial growth.[21] However, if there is major drop in pH, it could indicate shorter shelf life due to potential degradation over time. Lower pH can influence the emulsification of fats,[22] helping to create smaller lipid droplets with larger surface area, which can enhance the interaction with digestive enzymes, leading to more efficient absorption. pH also affects the permeability of the intestinal membrane, allowing for better uptake of nutrients. This is relevant for lipid-soluble vitamins dissolved in the ghrita. An increase in Specific gravity from 0.916 to 0.974 from 1st to 21st AVG was observed. Specific gravity is an important indicator of solute content in a solvent. This increase indicates that more active compounds may be solubilized in the successive AVG.

The Saponification value significantly increased from 214.35 to 241.38 from 1st to 21st AVG Samples. This increase indicates that during repeated *Ghritapaka* there may be dissociation of long chain fatty acids into short chain fatty acids. A high saponification value indicates more number of shorter chain fatty acids with low molecular weights.[23] Fats with shorter chain fatty acids are absorbed more quickly.[24] that ensures a more efficient delivery of active ingredients. After each Avartana, the AVG becomes more digestible due to a decrease in molecular weight. Furthermore, a higher saponification value can enhance the stability of the ghrita, as short chain fatty acids can form stable emulsions.[25] They have improved thermal stability, and can withstand heat during processing or storage. Hence, a high saponification value is essential for optimal absorption and stability. Simultaneously, a gradual increase in Iodine values of 1st to 21st AVG from 30.289 to 35.661 was seen, indicating more unsaturated form and prone to early rancidity. The increase here may be due to Fatty Acid Transformation. The repeated heating process could have lead to the breakdown of some saturated fats into unsaturated fatty acids. As per a study conducted to assess the effects of Iodine value on fatty acid digestibility, results showed an increased iodine value (Increasing unsaturation) of fats increased apparent fatty acid digestibility.[26] In the AVG samples, the

iodine value increased with successive avartana, suggesting a potential enhancement in the digestibility and absorption of fatty acids of the ghrita. The acid value ranged from 1.25 to 3.69 from 1st to 21st AVG. It measures the amount of Free Fatty acids (FFA) present in the ghrita, which arises from the breakdown of fats due to oxidation which is detrimental to shelf life. However, the FFA play a significant biological role. As per a study conducted, FFAs is the form (Usually non-esterified) in which Fatty acids leave the cell to be transported for use in another part of the body.[27] FFAs are a key source of energy, easier for the body to absorb, are taken up and used directly as an energy substrate by tissues including the skeletal muscle, liver, and heart. The release of free fatty acids allows for the preservation of glucose stores for tissues that are unable to use lipid stores such as the brain. FFAs are also required for insulin secretion. Therefore, they play a crucial role in energy metabolism. The increased digestibility due to FFAs suggests that lower doses of AVG may be effective. Hence, while the increase in iodine and acid values may reduce the product's shelf life due to rancidity, these changes enhance the absorption and digestibility of fatty acids, making the product biologically and therapeutically more effective. Rancidity occurs to the deterioration of unsaturated fats on oxidation, resulting in unpleasant odors and flavors. The rancidity test for the tested samples showed no change, indicating none of the samples showed signs of spoilage.

CONCLUSION

Avartana in *Sneha Kalpana* is a transformative process that elevates the potency and effectiveness of herbal formulations. This analytical study revealed the impact of Avartana on the shelf life and biological benefits of Sneha Kalpana formulations. Therefore, the physicochemical analysis indicates that, Avartana or repeated cycles, concentrates active constituents, amplify therapeutic benefits of formulations, making it suitable for administeration in lower doses.

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