

A COMPARATIVE PHARMACEUTICAL STUDY OF SARASVATA GHRITA AND SAPTA AVARTITA SARASVATA GHRITA

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ABSTRACT

Background: *Sneha Kalpana* is a pharmaceutical preparation, in which the base will be either oil or ghee. This contains both water soluble and fat-soluble constituents making it to reach deeper tissue. As these are lipophilic in nature it crosses the barriers in the body and get into targeted sites. This makes the formulation therapeutically more bioavailable. There are various medications in form of *Ghruta* in classical texts which is indicated for neurological disorders. Due to the inheriting consistency of ghee, this might be difficult to consume for some, particularly for children. Hence an attempt was initiated to evaluate pharmaceutically the efficacy of *Sapta Avartana Sarasvata Ghruta* as that of *Sarasvata Ghruta*. **Aim:** To compare and evaluate the organoleptic properties of *Sarasvata Ghruta* and *Sapta Avartita Sarasvata Ghruta*. **Methods:** *Sarasvata Ghruta*(SG) was prepared using *Murchita Ghruta* as *Sneha*

Dravya; *Kalka Dravyas* such as *Haritaki*, *Shunti*, *Maricha*, *Pippali*, *Patha*, *Vacha*, *Shigru*, and *Saindhava Lavana*; and *Drava Dravyas* were *Aja Ksheera* and *Jala*. These were taken in the ratio 1:4:16. The preparation was carried out in *Mandagni* till *Madhyama Paka Lakshanas* were obtained. For obtaining *Sapta Avartita Sarasvata Ghruta*(SASG) the entire process was repeated for seven times. **Results:** The yield of *Sarasvata Ghruta* was 84.63% while for *Sapta Avartita Sarasvata Ghruta* it came as 99.43% due to the accumulation of fat molecules from the goat's milk. Organoleptically, SG had yellow green colour with smooth

and thick consistency, whereas SASG turned dark green with a free flowing consistency.

Conclusion: The process of *Avartana* has altered the physical form and maintained the same chemical constituents with variation in quantity. The free-flowing consistency of SASG has enhanced the lipid solubility and absorption. *Ghrita* is known for its property to cross the blood brain barrier, the formulation certainly act on the neurological system. As the formula is concentrated due to repeated addition of the ingredients, the therapeutic dose can be minimised after confirming through analytical, experimental and clinical studies.

INTRODUCTION

Bhaishajya Kalpana explains various method of processing through different *Samskaras* like combination and separation of drugs, keeping it for desired time period, processing by heat, water etc. In case of *Sneha Kalpana*, it extracts both lipid soluble and water -soluble active principles. Each dosage forms are designed to deliver active principles via effective routes to the targeted sites. The *Samhitas* designate *Goghrita* as *Medhya* and *Samskarasya Anuvartanath*. In *Caraka Samhita*, it is mentioned as *Nityasevaniya Ahaara*. Ghee is good for enhancing intellect, memory, discriminative ability, digestion and metabolism, immunity, virility, vision.^[1]

Ghee contains short-chain fatty acids (SCFAs). These are among the many metabolites released by gut microbes, which can cross the blood-brain barrier (BBB) and interact with microglia. High concentrations of individual SCFAs decrease the inflammatory responses of peripheral monocytes. Ghee is a source of fat-soluble vitamins including vitamin A (28.21 ± 0.142 IU/g), vitamin D (11.42 ± 0.425 IU/g), vitamin E (31.55 ± 1.109 IU/g), vitamin K, and phospholipids.^[2]

Sarasvata ghrita is a formulation which is mainly indicated for childrens. It is indicated for speech delay or difficulties, improve memory intelligence and digestion power.

Avartana is one such technique by which oleaginous medicaments can be reduced into small dosage form, meanwhile increasing its potency. The consistency, colour and odour of the product changes after each *Avartana*. Due to the repetitive processing of *Sneha* there may be change in the molecular structure and it may be the reason for its increased efficacy and greater bioavailability. *Avartana* process also facilitate easy and proper administration with reduced dose.^[3] *Acharya* Gayadas further states that the *Ksheera* which is added during the

process of *Avartana* will compensate the loss to some extent. According to Jejjata, in the process of *Avartana* the *Drava Dravya* should be added at a single stretch.

MATERIALS AND METHODS

Materials used

Drugs listed as ingredients of *Ghrita Murchana* (Table 1), drugs which are mentioned as ingredients of *Sarasvata Ghrita* (Table 2), wide mouthed steel vessels for preparation, long spatula for stirring, *Khalwa Yantra*, measuring jar, weighing machine, kora cloth and gas stove as fire source.

PREPARATION OF MURCHITA GHRITA

Ingredients of *Murchita Ghrita*.

Table No 1: Ingredients For Preparation Of *Murchita Ghrita*.

Sl. No.	DRUGS	BOTANICAL NAME	FAMILY	PART USED	QUANTITY
1.	<i>Haritaki</i>	<i>Terminalia chebula</i> Retz.	Combretacea	Pericarp	106g
2.	<i>Amalaki</i>	<i>Emblca officinalis</i> Gaertn.	Euphorbiaceae	Pericarp	106g
3.	<i>Vibhitaki</i>	<i>Terminalia belerica</i> Roxb.	Combretacea	Pericarp	106g
4.	<i>Musta</i>	<i>Cyprus rotundus</i> Linn.	Cyperacea	Rhizome	106g
5.	<i>Haridra</i>	<i>Curcuma longa</i> Linn.	Zingiberacea	Rhizome	106g
6.	<i>Matulunga</i>	<i>Citrus medica</i> Linn.	Rutacea	Fruit	200mL
7.	<i>Goghrita</i>	-	-	-	1700mL
8.	<i>Jala</i>	-	-	-	1700mL

Procedure

The ingredient were finely powdered using pulveriser and passed through sieve number 85. The homogenous mixture was then made into bolus by grinding with *Matulunga Swarasa* in a mortar and pestle. *Goghrita* was taken in a wide mouthed stainless steel vessel and heated over mild fire. The prepared *Kalka* was added to the *Goghrita* followed by addition of *Jala*. This was stirred continuously to prevent *Kalka* from getting charred or adhering to the bottom of the vessel and the temperature was maintained from 85°C to 96°C. The stove was turned off and the *Ghrita* was left overnight. Next day the process was continued till the attainment of *Madhyamapaka Lakshana* and *Sneha Siddhi Lakshanas* were checked. After confirming *Sneha Siddhi Lakshanas* the stove was turned off and the *Murchita Ghrita* was filtered through a clean cloth. After cooling, the final product obtained was measured and was stored in an air tight container.

Confirmatory Tests To Check *Ghrita Paka* (*Sneha Siddhi Lakshanas*).

- ⇒ *Varti Pareeksha*- *Kalka* attained *Varti* shape when rolled between fingers and was soft in texture.
- ⇒ *Agni Pareeksha*- No crackling sound was present when *Kalka* was put into fire indicating the absence of water content.
- ⇒ *Phena Shanti*- Disappearance of froth was observed after the attainment of *Madhyama Paka*.
- ⇒ *Ganda Varna Rasothpathi*- A characteristic odour and colour of *Murchita Ghrita* was evident.

Sequential Preparation Of *Sapta Avartita Sarasvata Ghrita*

Sarasvata Ghrita was prepared using the following ingredients.

Table No. 2: Ingredients For Preparation Of *Sarasvata Ghrita*.

Sl. No	Drug	Botanical name	Family	Part used	Quantity
1.	<i>Aja Ksheera</i> (Goat's milk)	-	-	-	6.144L
2.	<i>Haritaki</i>	<i>Terminalia chebula</i> Retz.	Combretaceae	Pericarp	48 g
3.	<i>Shunti</i>	<i>Zingiber officinale</i> Roxb.	Zingiberaceae	Rhizome	48 g
4.	<i>Maricha</i>	<i>Piper nigrum</i> Linn.	Piperaceae	Fruit	48 g
5.	<i>Pippali</i>	<i>Piper longum</i> Linn.	Piperaceae	Fruit	48 g
6.	<i>Patha</i>	<i>Cissampelos pareira</i> Linn.	Menispermaceae	Root	48 g
7.	<i>Vacha</i>	<i>Acorus calamus</i> Linn.	Araceae	Rhizome	48 g
8.	<i>Shigru</i>	<i>Moringa oleifera</i> Lam.	Moringaceae	Root bark	48 g
9.	<i>Saindhava Lavana</i> (Rock salt)	-	-	-	48 g
10.	<i>Jala</i> (Water)	-	-	-	6.144L
11.	<i>Goghrita</i> (cow's ghee)	-	-	-	1.536L

PROCEDURE**a. Method of preparation of *Kalka***

The ingredient (*Haritaki*, *Shunti*, *Maricha*, *Pippali*, *Patha*, *Vacha*, *Shigru*, *Saindhava lavana*) were finely powdered using pulveriser and passed through sieve number 85. The homogenous mixture was then made into bolus by grinding with *Jala* in a mortar and pestle.

b. *Ghrita Paka*

Murchita Goghrita was taken in a wide mouthed stainless steel vessel and heated over mild fire. The prepared *Kalka* was added to the *Murchita Goghrita* followed by addition of *Jala*. *Aja Ksheera* was added to it. This was stirred continuously to prevent *Kalka* from getting charred or adhering to the bottom of the vessel. The stove was turned off after the boiling of

Ghrita. The vessel was then covered with a clean cloth and kept overnight. Next day *Ghrita* was again kept for boiling till it attains *Amapaka*. It was kept overnight after the vessel was covered with a clean cloth. On the third day it was kept over *Madhyama Agni*. (85°C-96°C). The process was continued till the attainment of *Madhyamapaka Lakshana* and *Sneha Siddhi Lakshanas* were checked. After confirming *Sneha Siddhi Lakshanas* the stove was turned off and the *Murchita Ghrita* was filtered through a clean cloth. After cooling, the final product obtained was measured and was stored in an air tight container.

For succeeding *Avartana*, preceeding *Avartita Ghrita* was taken, and prescribed amount of *Kalka* and *Drava Dravyas* was added, till seven processing was completed.

Table No 3: Quantity Of *Dravya* Taken In Each *Avartana*.

Practical	<i>Ghrita</i> quantity	<i>Kalka</i> quantity (per ingredient)	<i>Drava Dravya</i> quantity (each <i>Aja Ksheera</i> and <i>Jala</i>)
<i>Sarasvata Ghrita</i>	1.536 L	48 g	6.144 L
<i>Dwithiya Avartita Sarasvata Ghrita</i>	1.200 L	38 g	4.800 L
<i>Tritiya Avartita Sarasvata Ghrita</i>	1.100 L	34 g	4.400 L
<i>Chathurtha Avartita Sarasvata Ghrita</i>	1.000 L	31 g	4.000 L
<i>Panchama Avartita Sarasvata Ghrita</i>	920 mL	29 g	3.680 L
<i>Shad Avartita Sarasvata Ghrita</i>	890 mL	28 g	3.560 L
<i>Sapta Avartita Sarasvata Ghrita</i>	890 mL	28g	3.560 L



Figure 1.1 *Murchita Ghrita* poured to a vessel



Figure 1.2 Addition of *Kalka*



Figure 1.3 Addition of *Kalka*



Figure 1.4 Addition of *Aja Dugdha*

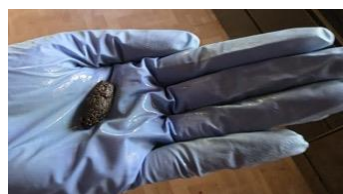


Figure 1.5 Attainment of *Snehasidhi Lakshana*

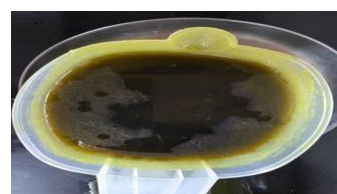


Figure 1.6 Product Obtained *Sarasvata Ghrita*

Figure No. 1: Preparation Of *Sarasvata Ghrita*.



Figure 2.1 Addition of *Sarasvata Ghrita*



Figure 2.2 Boiling after addition of *Kalka, Jala & Dugdha*

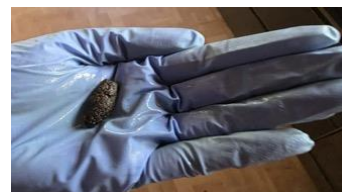


Figure 2.3 Attainment of *Snehasidhi Lakshana*

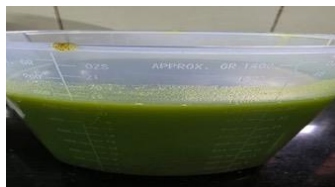


Figure 2.4: Product obtained- *Sarasvata Dwithiya Avartita Ghrita*

Figure no. 2: Preparation of *Dwithiya Avartita Sarasvata Ghrita*.



Figure 3.1 *Dwithiya Avartita Sarasvata Ghrita* poured to a vessel



Figure 3.2 Boiling after addition of *Kalka, Jala & Dugdha*



Figure 3.3 *Kalka* got separated from *Ghrita* on third day



Figure 3.4 Attainment of *Snehasidhi Lakshana* (no cracking sound)



Figure 3.5 Product obtained- *Sarasvata Trithiya Avartita Ghrita*

Figure No. 3: Preparation of *Trithiya Avartita Sarasvata Ghrita*.



Figure 4.1 Addition of *Kalka* to *Trithiya Avartita Sarasvata Ghrita*



Figure 4.2 Addition of *Ajadugdha* after addition of *Jala*



Figure 4.3 *Phenashanti* obtained on third day



Figure 4.4 Product obtained- Chathurtha Avartita Sarasvata Ghrita

Figure No. 4: Preparation Of Chathurtha Avartita Sarasvata Ghrita.



Figure 5.1 Addition of Ajadugdha to Ghrita after addition of Jala and Kalka



Figure 5.2 Boiling on second day



Figure 5.3 Rolled into Varti



Figure 5.4 Product obtained- Panchama Avartita Sarasvata Ghrita

Figure No. 5: Preparation Of Panchama Avartita Sarasvata Ghrita.



Figure 6.1 Ingredients for Shad Avartita Sarasvata Ghrita



Figure 6.2 Boiling of Ghrita after addition of Kalka and Drava Dravyas



Figure 6.3 Phenashanti obtained on third day



Figure 6.4 Product obtained- Shad Avartita Sarasvata Ghrita

Figure No. 6: Preparation Of Shad Avartita Sarasvata Ghrita.



Figure 7.1 Addition of Kalka to Shad Avartita Saravata Ghrita



Figure 7.2 Addition of Drava Dravyas

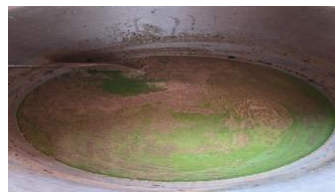


Figure 7.3 Kept overnight on second day



Figure 7.4 Phenashanti obtained on third day



Figure 7.5 Attainment of Snehasidhi Lakshana (no cracking sound)



Figure 7.6 Final product obtained- Sapta Avartita Saravata Ghrita

Figure No. 7: Preparation of Sapta Avartita Saravata Ghrita.

RESULT

Table N0. 4: Temperature During Ghrita Paka.

FORMULATION	AMA PAKA TEMPRATURE	BOILING TEMPRATURE	MADHYAMA PAKA TEMPRATURE
<i>Saravata Ghrita</i>	91°C	95°C	93°C
<i>Dwithiya Avartita Saravata Ghrita</i>	91°C	94°C	91°C
<i>Tritiya Avartita Saravata Ghrita</i>	96°C	96°C	95°C
<i>Chathurtha Avartita Saravata Ghrita</i>	93°C	93°C	94°C
<i>Panchama Avartita Saravata Ghrita</i>	94°C	95°C	95°C
<i>Shad Avartita Saravata Ghrita</i>	92°C	94°C	93°C
<i>Sapta Avartita Saravata Ghrita</i>	92°C	92°C	92°C

Table N0. 5: Organoleptic Characteristics of Saravata Ghrita And Sapta Avartita Saravata Ghrita.

Parameter	<i>Saravata Ghrita</i>	<i>Sapta Avartita Saravata Ghrita</i>
Colour	Yellowish Green	Green
Taste	Bitter	Bitter
Odour	Characteristic Odour	Characteristic Odour
Consistency	Unctuous Liquid	Fluid

Table No. 6: Yield Obtained In Different Avartana.

Formulation	Time taken	Initial quantity (mL)	Final quantity (mL)	Yield Percentage (%)
<i>Murchitha Ghrita</i>	8 hours 25minutes	1700	1550	91.17
<i>Saravata Ghrita</i>	10 hours 25 minutes	1536	1300	84.63

<i>Dwithiya Avartita Sarasvata Ghrita</i>	6 hours 30 minutes	1200	1100	91.66
<i>Trithiya Avartita Sarasvata Ghrita</i>	5 hours 30 minutes	1100	1000	90.90
<i>Chathurtha Avartita Sarasvata Ghrita</i>	5 hours 20 minutes	1000	920	92
<i>Panchama Avartita Sarasvata Ghrita</i>	5 hours	920	890	96.73
<i>Shad Avartita Sarasvata Ghrita</i>	4 hours 40 minutes	890	890	100
<i>Sapta Avartita Sarasvata Ghrita</i>	4 hours 30 minutes	890	885	99.43

DISCUSSION

Preparation of *Murchita Ghrita*

Ghrita Murchana was done according to the classical reference mentioned in the textbook *Bhaishajya Ratnavali*. *Ghrita* was initially yellow in colour and after *Murchana* it was dark yellow. This could be due to the presence of curcuminoid which is a constituent in *Haridra*. The characteristic odour of *Murchita Ghrita* was due to the *Haridra* and *Matulunga*. The process was completed in 2 days as stated in the classics. The temperature at which *Madhyama Paka* was acquired is 94°C and the time taken to do *Murchana* of 1700ml of *Ghrita* is 8hrs 15minutes.

Preparation of *Sarasvata Ghrita*

A total of 348g of *Kalka* was added to 1536mL of *Ghrita*. Sizzling sound was produced as the moisture turned into vapours. Thermal energy, released phytochemicals from different ingredients of *Kalka* into the *Ghrita*. Then 6144mL of each of *Jala* and *Aja Ksheera* was added which encouraged the release of water-soluble compounds from the *Drava Dravya*. After heating for a while, there was appearance of froth which is due to the hydrolysis. There will be a release of fatty acids from *Aja Ksheera* to the *Ghrita*. Colour of mixture turns to light brown, which denotes that the hydrophilic compounds from the *Kalka* was released. Vapours, were more which indicates water content. *Madhyama Agni* was maintained throughout the procedure so that this prevented from reaching its smoke point. Heating beyond smoke point causes oxidative stress by the formation of glycerol, and free fatty acid. Keeping the *Ghrita* overnight helped to transfer the active principles from *Kalka* and *Drava Dravya*. This also softens the *Kalka* so that the complex structure will be broken. The next day, it was heated again and around 91°C it attained *Ama Paka* where the *Kalka* doesn't

adhere amongst and more frothing was present and the water part almost got evaporated. Kept for overnight which ensure maximum yield of phytochemicals.

On third day *Ghrita* was again heated. Vapours, were less which indicates low water level and due to this *Kalka* was seen separated from the *Ghrita* when this reached *Mridu Paka*. *Kalka* turns golden brown and a sticky bolus with complete absence was water content. The temperature at which *Madhyama Paka* attained was 93°C. Characteristic smell of *Sarasvata Ghrita* was also present at this stage. The colour improved to yellowish green, which is due to the presence of chlorophyll pigment provided by the bark of *Shigru* and *Patha*. Total time taken was 9 hours and 30 minutes.

Preparation of *Dwitiya Avartita Sarasvata Ghrita*

A total of 328g of *Kalka* was added to 1200mL of *Ghrita*. Then 5200mL of each of *Jala* and *Aja Ksheera* was added. After heating for a while, there was appearance of froth, which is due to the hydrolysis. Steam was more which indicated appreciable water content. *Ghrita* was kept overnight which helped to transfer the active principles from *Kalka* and *Drava Dravya*. The next day, it was heated again and at 91°C it attained *Ama Paka*. Again, kept for overnight which ensure maximum yield of phytochemicals. Vapours, were less on heating for third day which indicates low water level. The temperature at which *Madhyama Paka* was attained was 91°C. Here it emitted characteristic smell of *Sarasvata Ghrita*. The colour improved to green. Total time taken was 8 hours 5 minutes.

Preparation of *Tritiya Avartita Sarasvata Ghrita*

A total of 272g of *Kalka* was added to 1100mL of *Ghrita*. Then 4400mL of each of *Jala* and *Aja Ksheera* was added. *Madhyama Paka* was obtained at 95°C. The colour improved to dark green than the previous *Avartana*. Total time taken was 5 hours 45 minutes.

Preparation of *Chathurtha Avartita Sarasvata Ghrita*

A total of 248g of *Kalka* was added to 1000mL of *Ghrita*. Then 4000mL of each of *Jala* and *Aja Ksheera* was added. *Madhyama Paka* was obtained at 94°C. The colour changed to dark green than the previous *Avartana*. Total time taken was 5 hours.

Preparation of *Panchama Avartita Sarasvata Ghrita*

A total of 232g of *Kalka* was added to 920mL of *Ghrita*. Then 3680mL of each of *Jala* and *Aja Ksheera* was added. *Madhyama Paka* was obtained at 95°C. Total time taken was 4 hours

and 55 minutes. Vigorous spilling was present at the third day because the mixture has become viscous and concentrated after the water being evaporated for the first two days. The steam generated cannot escape freely, instead, they push the mixture upward, resulting in sudden spilling.

Preparation of *Shad Avartita Sarasvata Ghrita*

A total of 224g of *Kalka* was added to 890mL of *Ghrita*. Then 3560mL of each of *Jala* and *Aja Ksheera* was added. With every *Avartana*, the density of the *Ghrita* increased due to the accumulation of extractive principles. Higher viscosity hinders bubbling due to resistance. This made spilling less intense than in the previous *Avartana*. *Madhyama Paka* was obtained at 93°C. The colour changed to dark green than the previous *Avartana*. Total time taken was 4 hours 40 minutes. The quantity of final product is same as that of initial quantity taken, which infers that the fat molecules from goat milk was added to the *Ghrita* while processing. Added to this the spilling was less which decreased the loss.

Preparation of *Sapta Avartita Sarasvata Ghrita*

A total of 224g of *Kalka* was added to 890mL of *Ghrita*. Then 3560mL of each of *Jala* and *Aja Ksheera* was added. The texture of *Ghrita* was smooth. *Madhyama Paka* was obtained at 92°C. The colour changed to dark green than the previous *Avartana*. Total time taken was 4 hours and 20 minutes. The time taken was comparably less due to fast escaping of vapours.

Spilling of *Ghrita*

Vigorous spilling was present at the third day (after *Chathurtha Avartana*) because the mixture has become viscous and concentrated after the water being evaporated for the first two days. The steam generated cannot escape freely, instead, they push the mixture upward, resulting in sudden spilling.

Colour Variation

As the *Kalka* is added repeatedly the phytoconstituents such as chlorophyll, other polyphenols present in this will transfer to the *Ghrita*.

Reason for Loss

The loss in first four *Avartana* might be due to filtering, the product left over in the vessel after preparation, spilling and loss of volatile compounds during the heating process.

Free Flowing Consistency

Loss of volatile saturated fatty acid and good extraction of unsaturated fatty acid from *Kalka* during continuous heating make the *Ghrita* less viscous in nature.

CONCLUSION

While *Sarasvata Ghrita* and its *Avartana* was prepared it was observed that the *Ghrita* reached a maximum temperature of 98°C when it was heated to remove moisture, once the *Kalka* and *Drava Dravya* was added the maximum temperature attained was 85°C. In the entire process the temperature maintained was between 88°C to 98°C.

Another important observation was the colour. In *Sarasvata Ghrita* it was yellowish green and in *Sapta Avartita Sarasvata Ghrita* it was dark green. But in *Sarasvata Ghrita* the texture was smooth and thick than that of *Sapta Avartita Sarasvata Ghrita*, which was not thick and free flowing.

The yield was high in *Sapta Avartita Sarasvata Ghrita* which was 100%, whereas in *Sarasvata Ghrita* it was 84.63%. This concludes that after certain times of *Avartana* the percentage of lose will be reduced as the particular formulation contains milk as an ingredient.

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