J. Pharm. Res. 2026;25(2):124-129

Print ISSN: 0973-7200
Online ISSN: 2454-8405

Journal of Pharmaceutical Research

ORIGINAL ARTICLE

Analytical Validation of '*Murcchana*' on the Stability and Phytochemical Profile of *Sunthi Ghrita*: A Comparative Study

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ARTICLE INFO

Article history:
Received 30-04-2026
Accepted 12-06-2026
Published 06-07-2026

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https://doi.org/10.18579/jopcr/v25.i2.106

ABSTRACT

Sneha Kalpana is a dosage form where herbal, mineral or animal drugs are processed in lipid bases like ghee, oil, animal fats. *Murcchana* is considered as a refining process practiced in *Sneha kalpana* to enhance their potency, providing odour, enhances stability. *Sunti Ghrita* (ghee) is one such *ghrita*-based formulation described in Bhaishajya Ratnavali indicated in. Though it is widely practiced, a thorough analysis or phytochemical profiling is not available till present. There are four formulations: *Goghrita, Murcchita Ghrita, Murcchita Sunthi Ghrita* and *Amurcchita Sunthi Ghrita*. *Sneha Kalpana* principles for the preparation of the four samples. Analytical parameters, like acid value, rancidity, pH etc were tested and Phytochemical profiling was performed through HPTLC. *Murcchita Sunthi Ghrita* was the stable among all the formulations. It had lowest acid value, lowest peroxide value and the lowest moisture content among all the four samples, indicating its enhanced stability. HPTLC phytochemical analysis emphasized the probable presence of *gallic acid, zingerone* and *curcumin.* They are primarily recognized as potent antioxidants and anti-inflammatory agents. The findings concluded that *Murcchana* may enhance the stability of *ghrita* by lowering the factors like peroxide value, moisture content and acid value. The present study gives ample proof that traditional refining method, '*murcchana'* of lipid resources such as ghee, oil etc through herbal drugs is expected to hold a unique potential in enhancing the stability and boosting the potency of these resources into dosage forms.

Keywords: *Sunti Ghrita, Murcchana, Sneha Kalpana*, HPTLC

INTRODUCTION

In Ayurveda *Sneha Kalpana* is considered as an important dosage form where, lipid subsatnces like oils, ghee, animal fats are processed with herbs, minerals or any other drugs[1]. This particular dosage form is considered as an augmented processing of *Panchavidha Kashaya kalpana*[2] (the five basic dosage forms) which is expected to have specific pharmacological properties and more shelf life compared to the latter[3]. It is generally based on the principle of embedding the phytoconstituents of herbs introduced either as *kalka* (bolus) and *drava dravya* into a complex lipid structure. Studies have hinted that *sneha kalpana* is the process of embedding hydrophilic bioactive phytochemicals inside lipid molecules[4], representing a liposomal drug delivery system[5] *Ghrita*, which is clarified butter from milk is considered the best among *Sneha Dravya*[6]. This is because *Ghrita* has property to assimilate the drug which is processed in it[7], thereby acting as a carrier to deliver those

bioactive compounds into the tissues. *Murcchana* is advised as mandatory for all lipid compounds before using in any formulation[8]. *Murcchana* process is a way to refine raw lipid resources before incorporating it into the preparation of any formulation. *Murcchana* includes usage of specific drugs like *Haritaki, Vibhitaki, Amalaki*, *Musta*, *Haridra* and *Matulunga swarasa*[9] used to prepare *kalka* (Bolus) processed to transfer the active phytoconstituents from *kalka davya* and fortified into *ghrita*. This process makes the ghee more stable and effective[10]. *Sunthi Ghrita* is a formulation described in Bhaishajya Ratnavali[11], it is indicated in all types of *sotha* and *amaja grahani roga*[12]. Even though it is widely used in clinical practice, a thorough analysis or phytochemical profiling is not available till present. The present study compares all 4 types of *Ghrita; Go Ghrita*, *Murcchita Ghrita*, *Murcchita Sunthi Ghrita* and *Amurcchita Sunthi Ghrita,* with an objective of proving the effect of *Murcchana* and phytochemical screening of *Sunti Ghrita*.

METHODOLOGY

The study compacts with the preparation of '*Sunti Ghrita'* consuming plain ghee and pre-processed ghee (*Murcchit Ghrita*) followed by its comparative organoleptic, physicochemical, HPTLC -phytochemical evaluation. These four samples of ghee were analysed which includes. Sample:1- *Go ghrita,* Sample:2- *Murcchit Ghrita,* Sample:3- *Murcchit Sunthi Ghrita* and Sample:4- *AmurcchitSunthi Ghrita*.

Sample 1: *Go Ghrita*

Plain cow ghee purchased from the local market was used for the preparation *Sunti ghrita*, the same ghee was of allotted as sample 1.

Sample 2: Preparation of *Murcchit Ghrita*[13, 14]

Table 1: Ingredients of *Murcchit Ghrita*

Sl. No.	Ingredients		Quantity
1	*Kalka Dravya*	*Triphala*, *Musta*, *Haridra, Matulunga swarasa*	25 Gm
2	*Sneha dravya*	Plain Ghee	100 ml
3	*Dravdravya*	Water	400 ml

Cow ghee was melted in a clean steel vessel and allowed for self-cooling. To this ghee water was added and heated in mild fire. The *kalka* prepared was then added to the ghee mixture and heating was continued until *Sneha Siddhi Laksana's* appeared (wick like formation of *kalka*, absence of cracking sound of *kalka* on igniting, lack of froth in ghee), indicating proper *Murcchana*. At the end the ghee was filtered and measured. 92 ml was filtered out which was stored in airtight container.

Go Ghrita *Triphala, Haridra, Musta* *Agni-samskara* *Murcchita Ghrita*

Fig. 1

Sample 3: Preparation of *Murcchit Sunthi Ghrita*[15]

Table 2: Ingredients of *Murcchit Sunthi Ghrita*

Sl. No.	Ingredients		Quantity
1	*Kalka Dravya*	*Sunthi (Zingiber officianale)*	25 Gm
2	*Sneha Dravya*	Plain Ghee	100 ml
3	*Drava Dravya*	*Dasamoola kwatha* (decoction of *Dasamoola*)	400 ml

Dashamoola kwatha was prepared by boiling 100 g of course *Dashamoola* in 1.6 L of water over mild fire and reducing to 400 ml.

The procedure was carried out, as per the guidelines of Sarangadhara Samhita. To the *Murcchita Ghrita* taken in a clean steel container, *Dashamoola kwatha* and *Sunthi kalka* was added and heated under mild fire. On attaining *Sneha Siddhi Lakshana's,* the ghee was filtered and stored in a clean dry airtight container and labelled.

Sunthi churna *Dashmoola kwath* *Murcchit Sunthi ghrita paka* *Murcchit Sunthi ghrita*

Fig. 2

Sample 4: Preparation of *Amurcchita Sunthi Ghrita*

The same procedure was followed using plain *Go Ghrita* to obtain *Amurcchita Sunthi Ghrita.*

Sunthi powder *Dashmoola kwath* *Sunthi ghrita paka* *Amurcchita Sunthi ghrita*

Fig. 3

RESULTS

The study samples were undergone analysis based on three benchmarks

a) Organoleptic, b) Physicochemcial and c) HPTLC phytochemical

On undergoing analysis, the results obtained were as follows:

Table 3: Observation

Parameters	*Ghrita*	*Murcchit Ghrita*	*Murcchit Sunthi Ghrita*	*Amurcchit Sunthi Ghrita*
A. Organoleptic parameters				
Colour	Pale Yellow	Yellowish green	Greenish yellow	Yellow
Odour	Mild Buttery	Aromatic	Pungent aromatic	Less aromatic
Taste	Neutral	Pleasant	Spicy	Slightly Bitter
B. Physicochemical parameters				
pH	5	5.5	5.6	5
Acid value	5.049	0.56	0.56	0.56
Specific Gravity @40 °C	0.901	0.919	0.927	0.918
Moisture content (%)	0.91%	0.89%	0.88%	0.92%
Rancidity	No	No	No	No
Iodine value	35.67	33.42	34.07	35.32
Saponification	219	224	228	226
Unsaponification	0.6%	0.9%	1.4%	1.1%
Refractive index @40 °C	1.449	1.451	1.452	1.448
Peroxide value	1.93	1.34	0.9	1.62
Viscosity	14.40	11.32	10.25	12.16

1. Analytical Study (HPTLC Profile Summary)

Sample preparation: Methanolic extracts of four ghee samples were prepared.

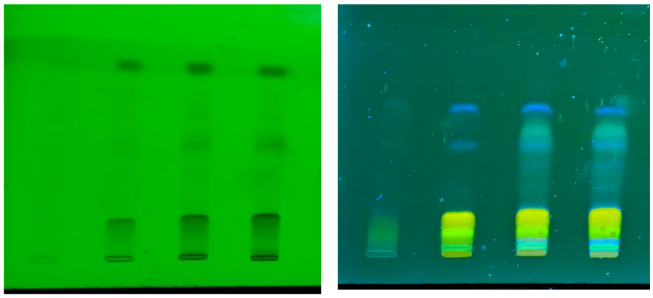
- Sample 1: Methanolic *Go Ghrita* extract
- Sample 2: Methanolic *Murcchit Ghrita* extract
- Sample 3: Methanolic *Murcchit Sunthi Ghrita* extract
- Sample 4: Methanolic *Amurcchit Sunthi Ghrita* extract

Stationary phase: Merk, HPTLC Silica gel 60 F_{254} plate.

Mobile phase: Toluene: Diethyl ether (8:2 v/v).

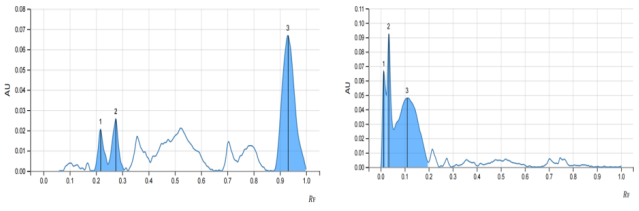
Visualization: UV visualization

- Wavelength: @254 nm and @366 nm
- Data recording: Rf values, band colours, and densitometric scans captured using CAMAG Visualizer.
- The chromatograms showed distinct fingerprint patterns for each 4 sample:



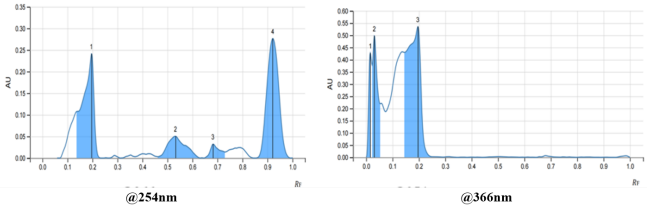
HPTLC @254nm HPTLC @366nm

Fig. 4



@254nm @366nm

Fig. 5: Methanolic *Go Ghrita* extract



@254nm @366nm

Fig. 6: Methanolic *Murcchita Ghrita* extract

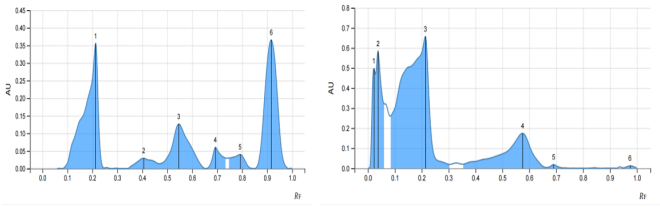


Fig. 7: Methanolic *Murcchita Sunthi Ghrita* extract

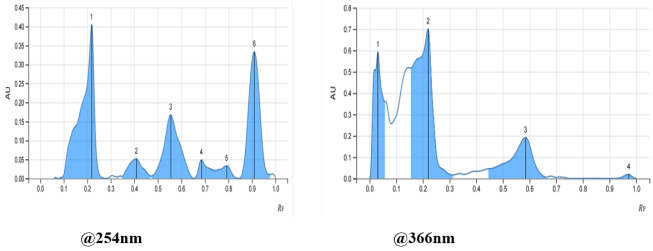


Fig. 8: Methanolic *Amurcchita Sunthi Ghrita* extract

Table 4: (Rf- Value)

Sample	Major peaks	Rf value Wavelength @254 nm	Major peaks	Rf value Wavelength @366 nm
1. Methanolic *Ghrita* extract	3	0.217	3	0.013
		0.275		0.033
		0.931		0.110
2. Methanolic *Murcchit Ghrita* extract	4	0.196	3	0.015
		0.532		0.031
		0.682		0.196
		0.921		
3. Methanolic *Murcchit Sunthi Ghrita* extract	6	0.212	6	0.022
		0.406		0.037
		0.546		0.214
		0.693		0.575
		0.792		0.690
		0.917		0.975
4. Methanolic *Amurcchit Sunthi Ghrita* extract	6	0.218	4	0.031
		0.408		0.219
		0.554		0.585
		0.685		0.972
		0.792		
		0.910		

DISCUSSION

Murcchana of lipid bases such as *Ghrita (Ghee)*, *Taila (oil)*, *Vasa (Fat)* is considered to be essential before preparing them into any suitable dosage form. The Methanolic extracts of the four samples taken in this study namely *Go ghrita* (plain ghee), *Murcchita Ghrita*, *Murcchita Sunthi Ghrita*, and *Amurcchita Sunthi Ghrita* on HPTLC profiling reveals the phytochemical refinement as a result of the *Murcchana* process and *Sunthi* fortification[17].

At 254 nm, the chromatogram of *Murcchita Ghrita* revealed four distinct peaks with Rf values 0.196, 0.532, 0.682, and 0.921, which are likely to be *gallic acid*, *quercetin*, *bisdemethoxycurcumin*, and *curcumin* respectively *(*Ashok Mateti *et al.*)[18]. These compounds are primarily derived from *Triphala*, *Musta*, and *Haridra* used during the *Murcchana* process. Their presence indicates successful extraction of phenolic and flavonoid components into the *ghrita* thereby improving the antioxidant and anti-inflammatory potential of the formulation. The correlation of these Rf values with literature (Ashok Mateti *et al.*)[18], (Dinesh Kumar *et al.*)[19] supports the identity of these bio actives.

In *Murcchita Sunthi Ghrita*, a more complex chromatographic profile was observed, with six peaks at 254 nm (Rf 0.212, 0.406, 0.546, 0.693, 0.792, and 0.917). These are supposed to be attributed to *gallic acid*, *zingerone*, *quercetin*, *bisdemethoxycurcumin*, *eugenol*, and *curcumin* respectively. The additional bands for *zingerone* and *eugenol* signify the incorporation of phytoconstituents from *Sunthi (Zingiber officinale)*. Both compounds are known for their antioxidant, carminative, and anti-inflammatory properties, validating the therapeutic enrichment achieved through the *Murcchana* process followed by *Sunthi* fortification[19].

Amurcchita Sunthi Ghrita displayed similar spots (Rf 0.218, 0.408, 0.554, 0.685, 0.792, and 0.910), but the intensity of peaks was comparatively lower, suggesting the potential of Murcchana to enhance the extractive capability of *ghrita* and influence the stability of active components within the ghee base. The result also points towards the significance of the *Murcchana* process in improving lipid-phase solubilization of herbal phytochemicals.

At 366 nm, additional peaks were observed in both *Murcchita* and *Amurcchita Sunthi Ghrita* extracts at Rf 0.037 and 0.031 which is tentatively identified as *rutin*, a polar flavonoid reported by (Sunil P. Waghmare *et al.*)[20]. Other peaks (Rf 0.022, 0.214, 0.575, 0.690, and 0.975) represented compounds of varying polarity, indicating a broad spectrum of photoactive constituents. The occurrence of both polar and non-polar components demonstrates the compatibility of *ghrita* as a biphase extraction medium capable of retaining diverse phytochemicals[21].

Comparatively, *Murcchita Sunthi Ghrita* showed the most enriched phytochemical fingerprint, confirming synergistic enhancement between the *Murcchana* procedure and *Sunthi* processing. This combination yielded a well-balanced formulation containing phenolic acids (gallic acid)[17], flavonoids (quercetin, rutin), and curcuminoids (curcumin derivatives) with volatile compounds like *zingerone* and *eugeno*[19, 22]. These bio actives compounds have proven pharmacological effects like antioxidative and anti-inflammatory. Thus, these analytical results showed that *Murcchana* not only detoxifies and stabilizes *ghrita* but also potentiates its therapeutic efficacy.

Sneha Kalpana is aimed to facilitate effective distribution of polar phytoconstituents beyond the lipid medium supporting a lipid envelop[6] which may improve stability, absorption, and therapeutic efficacy of dosage form. The observed change in colour from pale yellow to greenish-yellow and the development of strong aroma in *Murcchita Sunthi Ghrita* indicate efficient extraction of herbal constituents and removal of undesirable characteristics, which are classical features of *Murcchana*[23].

All samples exhibited slightly acidic pH (5–5.6), typical of lipid-based preparations[24], however, the reduced acid value in *Murcchita* samples suggested that the lower free fatty acid content and decreased oxidative degradation which indicates enhancement in stability. Slight increase in the specific gravity reflects the incorporation of phytoconstituents, while the minimal changes in refractive index confirm preservation of the lipid structure[23]. Additionally, lower moisture content and peroxide value in *Murcchita Sunthi Ghrita* signify better resistance to rancidity and oxidative deterioration[25].

Iodine value remained within the normal range which suggests that the fatty acid unsaturation is not adversely affected by processing, while the high saponification value suggests the presence of lower molecular weight of fatty acids, contributing to improved digestibility and bioavailability[26]. The high iodine value is due to its high content of unsaturated fatty acids[27]. Increased unsaponifiable matter further confirms the enrichment with bioactive compounds such as sterols and antioxidants[6].

Thus, based on the outcomes of physicochemical parameters, *Murcchita Sunthi Ghrita*, is expected to exhibit superior stability and quality among all the four formulations. This may also support the classical view that *Murcchana* might act as a refining process that enhances potency of *Sneha Kalpana* like *Grita, Taila* etc.[26]. Moreover, *Sunthi ghrita* prepared from *Murcchita Ghrita* may exhibit superior therapeutic properties compared to that prepared from plain *ghrita*, a difference attributable to its enriched profile of bioactive phytoconstituents, including gingerols, zingerone, and other phenolic compounds.

CONCLUSION

Among the two samples of *Sunti ghrita*, based on optimal analytical outcomes, *Sunti ghrita* prepared form *Murcchita ghrita* stands prime through the synergistic effect of drugs adopted for *Murcchana*. The physicochemical findings conclude that the parameters like Acid value, Iodine value, Peroxide value, Moisture content of *Murcchita Sunthi Gritha* are in optimum values suggesting its resistance to physicochemical variations like oxidation, lipid degradation etc. The phytochemical constituents present in the drugs of *Murcchana* like *gallic acid*, *quercetin*, *bisdemethoxycurcumin*, and *curcumin* from drugs *Triphala*, *Musta*, and *Haridra* are proved to be antioxidant, anti-inflammatory which enables activity like free radical scavenging, arresting lipid degradation, which may enhance the shelf life of *ghrita*.

DISCLOSURE

Acknowledgements:

The authors would like to express their sincere gratitude to their institution for providing the necessary facilities and support to carry out this research work. We also thank all individuals who directly or indirectly contributed to the completion of this study.

Source of Support and Fundings:

The authors received no financial support for the research, authorship, and/or publication of this article. This study was conducted without any external financial support or funding from public, commercial, or not-for-profit organizations.

Conflict of Interest statement:

The authors declare that there are no conflicts of interest related to this study.

Author Contribution Statement:

Both authors contributed equally to the conception, design, execution, and writing of the manuscript, and have approved the final version.

Consent to Participate:

Participation was voluntary, and informed consent was obtained from all participants in accordance with ethical standards.

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