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COMPARATIVE PHARMACEUTICAL STUDY AND STANDARDIZATION OF *MURCHCHHITA TILA TAILA* PREPARED FROM SELF-PREPARED AND MARKET SAMPLE

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ABSTRACT

Background: *Sneha Murchchhana* is a classical Ayurvedic pharmaceutical process used to eliminate *Amadosha* and *Gandhadosha* from *Taila* or *Ghrita*, thereby enhancing oxidation stability, bioavailability, and therapeutic efficacy. *Tila Taila* (sesame oil) serves as a principal vehicle (*Sneha Dravya*) in Ayurvedic pharmacy. **Objectives**: To establish Standard Manufacturing Procedures (SMP) and perform a comparative pharmaceutical and cost evaluation of three *Tila Taila* samples: self-prepared *Amurchchhita Tila Taila* (SPSAT), self-prepared *Murchchhita Tila Taila* (SPSMT), and market-sampled *Murchchhita Tila Taila* (MSMT). **Methods**: SPSAT was extracted via mechanical cold-pressing (*Pidana*). *Murchchhana* was conducted as per Bhaishajya Ratnavali reference using 11 herbal ingredients, including *Manjistha*, *Haridra*, *Musta*, *Triphala*, etc. Thermal profiles, process kinetics, organoleptic transitions, yields, and cost metrics were evaluated across three batches of each sample. **Results**: Mechanical cild press extraction yielded 34.17% (1367 mL/4 kg) *Tila Taila*. *Murchchhana* process validation demonstrated mean recovery yields of 96.66% for SPSMT and 98.33% for MSMT, requiring ~8 hours of *Sneha Paka* at 80 °C–96 °C to achieve classical *Snehasiddhi*

Lakshana. Production costs were ₹3,241/L for SPSMT versus ₹2,344/L for MSMT, driven by raw material procurement and extraction overheads. **Conclusion**: Strict thermal control during *Sneha Paka* ensures the *Snehasiddhi Lakshana*. Although market-sampled *Taila* provide economic efficiency, self-prepared *Tila Taila* samples ensures superior raw material purity and lipid integrity.

KEYWORDS: Ayurveda, Bhaishajya Kalpana, *Sneha Murchchhana*, *Tila Taila*, Standard Manufacturing Procedure (SMP), *Snehapaka.*

INTRODUCTION

Ayurveda, the traditional system of medicine, offers a unique therapeutic perspective by combining plant materials, metals, and minerals into sophisticated dosage forms designed to optimize biological bioavailability and systemic safety. Most active phytochemical constituents are lipophilic or water-soluble entities that cannot be directly absorbed into human tissue matrices without appropriate processing media. Consequently, Bhaishajya Kalpana encompasses specialized pharmaceutical procedures—including extraction, thermal processing, emulsification, digestion, and impregnation—to transform crude natural substances into potent, stable formulations.

Among the various secondary dosage forms, Sneha Kalpana, comprising medicated oils (*Taila*) and ghee (*Ghrita*), represents an important lipid-based Ayurvedic dosage form. The lipid medium facilitates the extraction and incorporation of lipophilic bioactive constituents from medicinal plants and may enhance their permeability across biological membranes, thereby potentially improving their absorption and bioavailability.[1] *Tila Taila* (sesame oil; *Sesamum indicum* Linn.) occupies a distinguished position among Ayurvedic oils and is regarded as the foremost (*Shreshtha*) among *Taila*. Classical Ayurvedic literature describes *Tila Taila* as *Sukshma* (subtle and penetrating) and *Vyavayi* (rapidly spreading), along with other properties such as *Tikshna* and *Ushna*.[1] It is also described as *Tvachya*,[2] indicating its beneficial action on the skin. These attributes have contributed to the extensive use of *Tila Taila* as a *Sneha* and as a base for various medicated oil preparations. When oil is extracted from sesame seed by oil expeller machine, impurities, colloids, pigments, free fatty acids and some other matters are existing which must be removed before therapeutic application. Refinement of oil can help to eliminate these matters which is mostly used in market. When crude oil undergoes oil refining process makes it lose those essential nutrients. But in *Sneha Murchchhana* process, both fat and water- soluble phytochemicals are used by adding

specific herbal drugs into the oil which may increase its stability, medicinal efficacy and useful for the base of medicated oil preparation. Ayurvedic pharmaceutical science mandates a specialized priming process known as *Sneha Murchchhana* prior to incorporating therapeutic herbs. *Murchchhana* process neutralizes *Amadosha* (undesirable characteristics), eliminates offensive odours i.e. *Gandhadosha*.,[2] imparts the colour and aroma, significantly extends shelf-life.[2]

In modern pharmaceutical practice, standardization and process validation are essential to guarantee batch-to-batch consistency, therapeutic safety, and global reproducibility. The present study was undertaken to standardize (prepared three batches of each sample) different samples of *Tila Taila*.

OBJECTIVES

1) To prepare *Tila Taila* by classical method. (SPSAT)
2) To develop SMP of *Tila Taila Murchchhana* prepared by two different samples of *Tila Taila.*
3) To prepare *Murchchhita Tila Taila* from self-prepared sample (SPSMT).
4) To prepare *Murchchhita Tila Taila* from market sample. (MSMT)
5) To analyze cost estimation of prepared *Tila Taila* samples.

MATERIALS AND METHODS

Procurement and identification of raw materials

White sesame seeds (*Sesamum indicum* Linn.) were procured from Khadi Gramodyog, Vadodara. Market-sampled *Tila Taila* was obtained from the Government Ayurved Pharmacy, Rajpipla, Gujarat. Raw drugs for *Tila Taila Murchchhana* which includes *Manjishtha, Haridra, Khasa, Lodhra, Musta, Nalika, Amalaki, Haritaki, Bibhitaki,* and *Suchipushpa*—were procured from local suppliers of Vadodara and Junagadh. Fresh *Vatankura* (leaf buds of Ficus bengalensis Linn.) were collected from the Gargi Bhavan girls' hostel campus, Vadodara.

All raw materials were authenticated at the Pharmacognosy Division, Food and Drugs Laboratory, Vadodara, Gujarat. Identification of raw drugs was confirmed through organoleptic parameters, macro-morphological evaluation, and powder microscopy.

Preparation of Drug

The pharmaceutical study was conducted at the Pharmaceutical Laboratory, Upgraded Department of Rasashastra and Bhaishajya Kalpana, Government Ayurved College, Vadodara, Gujarat, India. The whole pharmaceutical procedures were done under the following steps (3 batches were prepared for each practical to prepare SMP);

1. Preparation of *Tila Taila* by classical method (SPSAT – Self Prepared Sample of *Amurchchhita Tila Taila*)
2. Preparation of *Murchchhita Tila Taila* from self-prepared sample (SPSMT).
3. Preparation of *Murchchhita Tila Taila* from market sample. (MSMT)

1. Preparation of *Tila Taila* by classical method (SPSAT)

Self-Prepared *Amurchchhita Tila Taila* (SPSAT) was extracted following classical *Pidana*[1] principles using a food-grade 304 stainless-steel mechanical cold presses oil expeller machine (600 W, 220 V). Sesame seeds were added into the hopper of the oil expeller, and the machine was activated. The oil extracted from the cold press section of the expeller (After 15 minutes) was collected in a stainless-steel vessel, while a dry, flat, cream-coloured residual material was expelled from the front section containing the heating coil. The extracted oil was kept for 24 hours to allow for sedimentation. The supernatant oil was then heated to 105°C for 10 minutes and filtered through cotton cloth to remove any remaining impurities. The filtered oil was subsequently weighed and stored in an airtight, labeled glass container. Processing 4000 g of seeds required 120 minutes of continuous operation with a 30-minute break taken after every 4 kg of extraction. Process validation across three batches is mentioned in Table 1.

Table 1: Process validation and Yield for Self-Prepared *Amurchchhita Tila Taila* (SPSAT).

Parameter	Batch 1	Batch 2	Batch 3	Average / Mean
Initial Raw Seeds (g)	4000	4000	4000	4000.00
Obtained Oil Yield (mL)	1300	1400	1400	1366.67
Extraction Yield (%)	32.50	35.00	35.00	34.17
Residue Oil Cake (g)	2879	2685	2740	2768.00
Extraction Time (min)	120	120	120	120.00

2 Preparation of *Murchchhita Tila Taila* from self-prepared sample (SPSMT)

Based on the pilot study results, it was determined that 08:15 hours were required to complete the process. To achieve the endpoint parameter within two days, heat was maintained

between 80ºC and 96ºC for the liquid media, and between 310ºC and 407ºC for the flame. The vessel size was chosen according to the amount of material used. The main study was initiated with consideration of the observations from the pilot study. The SMP was ensured by conducting all procedures in three separate batches.

Name of practical: Preparation of *Murchchhita Tila Taila* from Self-prepared Sample of *Tila Taila.* (SPSMT)[3]

Reference: Bhaishajya Ratnavali *Jwararogadhikara* 5/ 1267-1268

Principle: *Snehapaka* (Heating)

Equipment**:** Electric weighing balance, measuring jar, porcelain mortal pestle, gas stove, matchbox, stainless steel vessels, spatula, pyrometer, cotton cloth.

Ingredients

Table 2: Ingredients for the preparation of *Murchchhita Tila Taila* from self-prepared sample. (SPSMT).

Sr. No.	Name of ingredients	Latin/English Name	Part used	Ratio	Quantity		
					Batch-1	Batch -2	Batch-3
1.	*Tila Taila*	*Sesamum indicum* Linn.	Seed oil	1 Part	1 L	1 L	1 L
2.	*Manjishtha*	*Rubia cordifolia* Linn.	Root	1/16th Part	71 g	71 g	71 g
3.	*Haridra*	*Curcuma longa* Linn.	Rhizome	1/64th Part	17 g	17 g	17 g
4.	*Khasa*	*Vetiveria zizanioides* L.	Root	1/64th Part	17 g	17 g	17 g
5.	*Lodhra*	*Symplocos racemose* Roxb.	Stem bark	1/64th Part	17 g	17 g	17 g
6.	*Musta*	*Cyperus rotandus* Linn.	Root	1/64th Part	17 g	17 g	17 g
7.	*Nalika*	*Cinnamomum tamala* Nees. Eberm	Stem bark	1/64th Part	17 g	17 g	17 g
8.	*Amalaki*	*Emblica officinalis* Gaertn.	Pericarp	1/64th Part	17 g	17 g	17 g
9.	*Haritaki*	*Terminalia chebula* Retz.	Pericarp	1/64th Part	17 g	17 g	17 g
10.	*Bibhitaki*	*Terminalia belerica* Roxb.	Pericarp	1/64th Part	17 g	17 g	17 g
11.	*Suchipushpa* (*Ketaki*)	*Pandanus tectorium* Soland ex. Parkinson	Root	1/64th Part	17 g	17 g	17 g
12.	*Vata*	*Ficus bengalensis* Linn.	Leaf bud	1/64th Part	17 g	17 g	17 g
13.	*Jala*	Potable water	-	4 Parts	4 L	4 L	4 L

Procedure

Ingredients no. 2 to 12 were taken in powder form and *Kalka* was prepared by adding water. *Tila Taila* was taken in s.s. vessel and heated over medium flame until the moisture evaporated. The *Kalka* was added to the *Tila Taila* followed by addition of water. The duration of heating was adjusted so that *Snehapaka* was completed in two days. The heating process was carried out till *Snehasiddhi Lakshana* appeared. Then the vessel was taken out from the fire and *Murchchhita Tila Taila* was filtered through double-folded cotton cloth in its hot stage. After self-cooling, the finished product was labelled and stored in an airtight glass container.

OBSERVATIONS

During heating in a stainless-steel vessel, *Tila Taila* shifted from pale to dark yellow while emitting its characteristic aroma. The addition of *Kalka* turned the mixture reddish-brown, which briefly brightened to reddish-orange with frothing upon adding water. Continuous heating restored the reddish-brown hue after one hour, releasing the distinct smell of *Manjistha* and *Nalika*, accompanied by bubbling and crackling sounds above 98 °C. By the third hour, the *Kalka* began settling at the base of the vessel. At the final stage of *Paka*, crackling sounds ceased completely, *Phenodgama* (frothing) appeared, and a non-sticky *Varti* could be rolled easily between the fingers. The *Kalka* ultimately turned blackish-brown with a lustrous sheen, yielding a dark reddish, viscous, and clearly separated *Murchchhita Tila Taila***.**

Table 3: Temperature and time during *Siddhi Lakshana* (SPSMT).

Sr. No.	*Siddhi Lakshana*	Batch-1			Batch-2			Batch-3		
		Temp. (ºC)		Time (Min)	Temp. (ºC)		Time (Min)	Temp. (ºC)		Time (Min)
		Flame	Media		Flame	Media		Flame	Media	
1	*Vartivat Sneha Kalka*	380	95	07:35	381	95	07:30	379	95	07:30
2	*Phenodgama*	401	95	07:45	392	94	07:45	397	96	07:45
3	*Shabdahina Agni Nikshipta*	391	94	07:58	400	96	07:58	402	96	07:58

RESULTS

Table 4: Results for the preparation of *Murchchhita Tila Taila* from self-prepared sample (SPSMT).

Parameters		Results			
		Batch-1	Batch-2	Batch-3	Average
Initial quantity of sesame oil (ml)		1000	1000	1000	1000
Quantity of *Kalka* (g)		477	474	482	477.66
Quantity of liquid media (ml)		4000	4000	4000	4000
Final quantity of *Murchchhita Tila Taila*	(ml)	970	960	970	966.66
	(%)	97	96	97	96.66
Quantity of residue (g)		484	479	490	484.33
Total Loss	(ml)	30	40	30	33.33
	(%)	3	4	3	3.33
Reason of Loss		Due to sticking in vessel, absorption in paste and filtration process			
Total time taken for preparation (Hrs: Min)		08:15			

3. Preparation of *Murchchhita Tila Taila* from market sample (MSMT)

Based on the pilot study results, it was determined that 08:00 hours were required to complete the process. To achieve the endpoint parameter within two days, heat was maintained between 80ºC and 96ºC for the liquid media, and between 310ºC and 407ºC for the flame. The vessel size was chosen according to the amount of material used. The main study was initiated with consideration of the observations from the pilot study. The SMP was ensured by conducting all procedures in three separate batches.

Name of practical: Preparation of *Murchchhita Tila Taila* from market Sample of *Tila Taila* (MSMT).

Reference: Bhaishajya Ratnavali *Jwararogadhikara* 5/ 1267-1268

Principle: *Snehapaka* (Heating)

Equipment**:** Electric weighing balance, measuring jar, porcelain mortal pestle, gas stove, matchbox, stainless steel vessels, spatula, pyrometer, cotton cloth.

Ingredients: Same as the ingredients for the preparation of *Murchchhita Tila Taila* from self-prepared sample (SPSMT) which is mentioned in Table 2.

Procedure

Same as the procedure for the preparation of *Murchchhita Tila Taila* from self-prepared sample (SPSMT).

OBSERVATIONS

Same as the observations for the preparation of *Murchchhita Tila Taila* from self-prepared sample (SPSMT).

Table 5: Temperature and time during *Siddhi Lakshana.*

Sr. No.	*Siddhi Lakshana*	Batch-1			Batch-2			Batch-3		
		Temp. (ºC)		Time (Min)	Temp. (ºC)		Time (Min)	Temp. (ºC)		Time (Min)
		Flame	Media		Flame	Media		Flame	Media	
1	*Vartivata Sneha Kalka*	382	96	07:30	375	95	07:35	379	95	07:30
2	*Phenodgama*	390	96	07:45	399	96	07:45	400	97	07:45
3	*Shabdahina Agni Nikshipta*	394	95	07:58	401	96	08:00	402	96	07:58

RESULTS

Table 6: Result for the preparation of *Murchchhita Tila Taila* of market sample (MSMT).

Parameters		Results			
		Batch-1	Batch-2	Batch-3	Average
Initial quantity of sesame oil (ml)		1000	1000	1000	1000
Quantity of *Kalka* (g)		496	502	465	478.66
Quantity of liquid media (ml)		4000	4000	4000	4000
Final quantity of *Murchchhita Tila Taila*	(ml)	990	980	980	983.33
	(%)	99	98	98	98.33
Quantity of residue (g)		509	515	472	498.66
Total Loss	(ml)	10	20	20	16.66
	(%)	1	2	2	1.66
Reason of Loss		Due to sticking in vessel, absorption in paste and filtration process			
Total time taken for preparation (Hrs: Min)		08:00			

Pharmaceutical comparison between two samples (SPSMT and MSMT)

In both groups, addition of herbal *Kalka* transformed the light-yellow oil into a reddish-brown matrix. Water integration produced initial surface foam and turned the media light orange. Upon reaching about 98°C, vigorous bubbling and steam expulsion occurred. By 3 hours of heating, *Kalka* paste began aggregating at the vessel base. Final *Snehapaka* yielded a rich, deep dark-reddish transparent oil with a pleasant aromatic smell, completely lacking raw seed odour.

Table 7: Temperature during operational stages of *Taila Murchchhana* process.

Operational Stage	SPSMT Flame (°C)	SPSMT Media (°C)	MSMT Flame (°C)	MSMT Media (°C)
Initial Base Heating	35 - 40	25 - 28	34 - 45	25 - 28
Addition of *Kalka*	248 - 255	57 - 63	252 - 259	60 - 63
Addition of Water	263 - 267	72 - 75	263 - 270	52 - 60
Boiling Stage (Peak Moisture)	410 - 457	100 - 101	400 - 430	100 - 101
Kalka Separation Phase	390 - 476	94 - 97	426 - 470	96 - 98
Endpoint / *Sneha Siddhi* Stage	379 - 402	94 - 96	375 - 402	95 - 97
Hot Filtration Stage	-	91.0	-	91.0 - 92.0

Comprehensive Cost Estimation Analysis

A precise financial evaluation was conducted encompassing raw material procurement, operational utilities (electricity, fuel gas), labor charges, and primary glass packaging across all four samples.

Table 8: Comparative Financial Cost Analysis per Liter Unit Yield.

Cost Component	SPSAT (12 Kg Seed)	SPSMT (1 L Batch)	MSMT (1 L Batch)
Raw Material Cost (₹)	₹ 2,880.00	₹ 1,290.00	₹ 470.00
Operational Utilities / Fuel (₹)	₹ 228.80	₹ 297.00	₹ 290.00
Labor Cost (₹)	₹ 300.00	₹ 974.00	₹ 974.00
Packaging Materials (₹)	₹ 570.00	₹ 570.00	₹ 570.00
Total Operational Cost (₹)	₹ 3,978.80	₹ 3,131.00	₹ 2,304.00
Obtained Final Yield	4,000 mL	966.66 mL	983.33 mL
Final Cost per Liter (₹/L)	₹ 995.00 / L	₹ 3,241.00 / L	₹ 2,344.00 / L

DISCUSSION

Sneha Murchchhana is a pharmaceutical process employed to purify, refine, and stabilise *Sneha Dravya*. Crude *Tila Taila* intrinsically contains *Amadosha*—comprising moisture, non-glyceride impurities, free fatty acids, and *Gandhadosha* (foul odour)—which predispose the oil to auto-oxidation and hydrolytic rancidity after some period of storage. The pharmaceutical transformation during *Murchchhana* mitigates these degradative factors via synergistic thermal and botanical interactions.

Mechanically expressed self-prepared *Tila Taila* (SPSAT) yielded 34.17%, with the remaining 65.83% retained as residue cake, reflecting the inherent yield threshold of mechanical *Pidana* compared to solvent extraction. Crucially, this self-prepared *Tila Taila* extraction ensures complete freedom from adulterants and chemical bleaching agents, establishing a pristine lipid base for subsequent *Sneha Kalpana*.

During *Sneha Paka*, maintaining oil temperatures between 80 °C and 96 °C under medium fire (*Madhyamagni*) can prevent the thermal degradation of thermolabile phytoconstituents. The addition of water (*Jala*) acts as a thermal buffer, allowing prolonged boiling that enhances the extraction of lipophilic and water-soluble bio-actives from *Kalka Dravya* into the lipid matrix. *Manjistha* (*Rubia cordifolia* Linn.) imparts a reddish hue via anthraquinone glycosides (purpurin and alizarin) while supplying lipophilic antioxidants, whereas *Haridra* (*Curcuma longa* Linn.) provides curcuminoids to prevent lipid peroxidation. Concurrently, *Triphala* and *Musta* offer polyphenols and tannins to deodorise and stabilise free fatty acids, while *Suchipushpa* and *Nalika* yield essential oils that mask crude seed odour.

Comparative evaluation demonstrated a higher recovery yield in MSMT (98.33%) than in SPSMT (96.66%). This 1.67% variation stems from differences in initial viscosity and surface tension, which increased *Kalka* absorption and vessel adhesion in the self-extracted sample. Nevertheless, both formulations reliably achieved classical *Snehasiddhi Lakshana* within approximately 8 hours of thermal processing. Economically, SPSMT (₹3,241/L) incurred an ₹897/L over MSMT (₹2,344/L) due to raw seed procurement and self-prepared *Tila Taila* extraction overheads; while commercial bases offer cost advantages for large-scale production, Self prepared *Tila Taila* ensures superior quality assurance, traceability, and batch integrity for specialised clinical use.

Plate no. 1: Unit Operative Procedure of *Tila Taila* Extraction

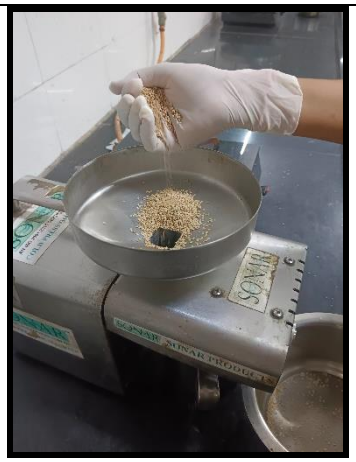
<table>
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<tr>
<td>Figure 1. Tila seeds</td>
<td>Figure 2. Tila added to the hopper</td>
<td>Figure 3. Oil extracted from expeller</td>
</tr>
</table>



Figure 4. residue



Figure 5. *Tila Taila*

Plate no. 2: Unit Operative Procedure of Tila Taila Murchchhana (SPSMT)



Figure 1. Ingredients



Figure 2. *Kalka* was prepared



Figure 3. Addition of *Tila Taila* to the s.s. vessel



Figure 4. Addition of *Kalka*



Figure 5. Addition of water



Figure 6. Foam appears



Figure 7. *Varti* was made



Figure 8. *Phenodgama*



Figure 9. *Taila* filtered through cotton cloth



Figure 10. *Murchchhita Tila Taila* (SPSMT)

Plate no. 3: Unit Operative Procedure of Tila Taila Murchchhana (MSMT)

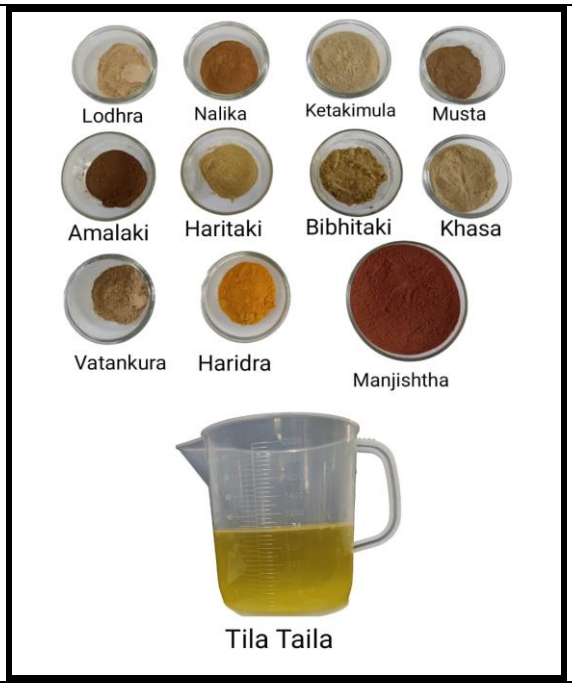


Figure 1. Ingredients



Figure 2. *Kalka* was prepared



Figure 3. Addition of *Tila Taila* to the s.s. vessel



Figure 4. Addition of *Kalka*



Figure 5. Addition of water



Figure 6. Foam appears

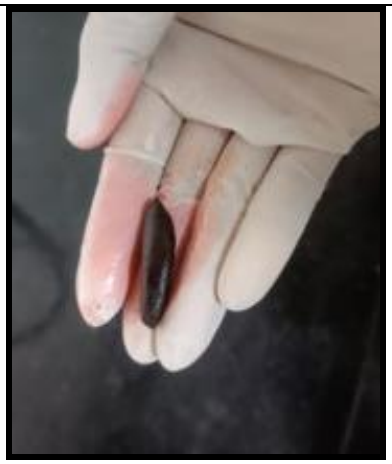


Figure 7. *Varti* was made



Figure 8. *Phenodgama*

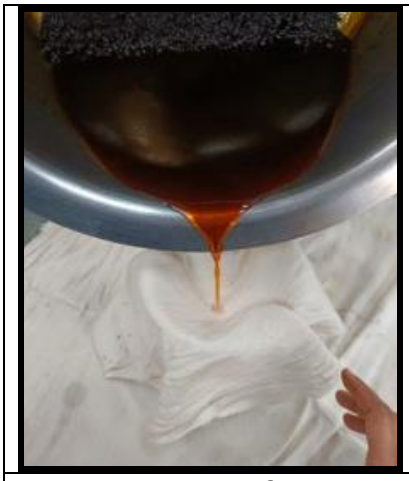


Figure 9. *Taila* filtered through cotton cloth



Figure 10. *Murchchhita Tila Taila* (MSMT)

CONCLUSION

The present research successfully establishes Standard Manufacturing Procedures (SMP) for classical *Tila Taila Murchchhana*. Thermal control within the 80°C–96°C range across an 8-hour processing window ensures optimal extraction of botanical actives without thermal degradation. *Murchchhana* process effectively removes raw seed odours, improves colour and aroma, and enhances overall product quality. While market-sampled *Taila* provide a cost-effective option for commercial production, self-prepared *Tila Taila* ensures total raw material purity and complete freedom from adulterants. The standardised pharmaceutical parameters established in this study serve as reliable benchmarks for industrial quality control and future clinical investigations.

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