



ORA- Analytical study

Preparation and Standardization of Classical Shalmali Malabarica Formulation (Siddha Shalmali Kalpa) A Potential Ayurvedic Aphrodisiac Formulation – A Pharmaceutical and Analytical Study

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ABSTRACT:

Background: The classical *Shalmali malabarica* formulation (*Siddha Shalmali Kalp, SSK*) is traditionally considered a potential aphrodisiac. Despite this, there is a lack of comprehensive pharmaceutico-analytical standardization and scientific validation. **Objective:** To prepare Classical *Shalmali malabarica* formulation (*SSK*) by using traditional methods and standardize to evaluate its Pharmaceutico- analytical parameters for quality, safety, and reproducibility, with the help of classical and contemporary parameters **Materials and methods:** All raw ingredients were sourced from GMP-certified, authentic sources. The formulation was prepared in three batches as per the classical methods described in *Bhaishajya Ratnavali*, including purification of Mercury and Sulfur, followed by the preparation of black sulfide of Mercury (1 part of Mercury and ½ part of Sulfur), and then its tribulation with a fine powder of other herbal ingredients. **Observation and Results:** Preparation of *Kajjali* showing gradual change from Gray to jet black with attainment of classical parameters like *Rekhapurntva*, etc. Sequential 14 wet grinding cycles (*Bhavana*) resulted in progressive improvement in color - jet black, texture - ultra fine, and smoothness. The total 275 g of formulation increased to 305 g, 300 g, and 305 g with a 10.9%, 9.09 g, and 10.9 g gain respectively, indicating effective incorporation of *bhavadravya*. Final production (Batch A, B, and C) meets acceptable physico-chemical values and a stable herbo-mineral composition, with essential elements and permissible trace metals. **Conclusion:** The study successfully standardizes three batches of the Classical *Shalmali malabarica* formulation (*SSK*) through classical pharmaceutical procedures and modern analytical evaluation, thereby confirming its identity, quality, and reproducibility. Physiochemical and XRF analyses confirmed a stable herbo-mineral composition, with essential elements within safe limits. This validates proper processing and safety of formulation. The findings support its potential as a standardized, safe, and effective aphrodisiac formulation, providing a scientific basis for further pharmacological and clinical studies.

KEYWORDS: Aphrodisiac Formulation, *Bhaishajya Ratnavali*, Classical *Shalmali Malabarica* Formulation, *Siddha Shalmali Kalpa*, *Vajikarna*

RECEIVED ON:

27-04-2026

REVISED ON:

16-06-2026; 27-06-2026

ACCEPTED ON:

02-07-2026

Access This Article
Online:

Quick Response Code:



Website Link:

<https://jahm.co.in>

DOI Link:

<https://doi.org/10.70066/jahm.v14i6.2765>

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CITE THIS ARTICLE AS

Pravin Kadappa Koparde, Mujahid Khan, Sheetal Pravin Koparde. Preparation and Standardization of Classical Shalmali Malabarica Formulation (Siddha Shalmali Kalpa) A Potential Ayurvedic Aphrodisiac Formulation – A Pharmaceutical and Analytical Study. Journal of Ayurveda and Holistic Medicine (JAHM) 2026; 14(6):73-87.



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1. INTRODUCTION

A substance, which is used to improve sexual satisfaction and behavior as well as to treat sexual dysfunction, is categorized as an aphrodisiac. [1] The word 'aphrodisiac' is derived from the Greek word 'Aphrodite', which means Goddess of sexual love and beauty. Since ancient times, humans have required a way to improve their sexual vitality. In the early stages of civilization, when humans lived with stone tools, expressions of sexual vigor were often conveyed through various rituals. Throughout recorded history, there has been sustained interest in discovering bioactive aphrodisiacs derived from natural sources such as plants, animals, and minerals, reflecting humanity's continuing quest to improve sexual health and performance. [2] In the context of *Ayurveda* classics, one of the eight branches that emphasizes the advancement of sexual vigor, fertility, and overall reproductive health is *Vajikarana*. [3] *Vaji* means meaning horse, and *karanata* means making, - measure to excite lust by charms, etc. [4] Traditional aphrodisiac formulations are not merely intended to stimulate libido. Still, they are believed to improve the quality of reproductive tissues, thereby contributing to physical strength, mental balance, and long life. [5]

In recent decades, there has been a noticeable rise in reproductive health disorders, stress related as well a life style related sexual dysfunction and declining fertility rates. Nearly, 15% of couples of reproductive ages are troubling Infertility. It is assessed that globally, 60–80 million of couples suffer from reproductive disorders like infertility per annum out of which almost 15–20 million are in India. [6] As per World Health Organization study on more than 8500 couples, the male factor contributes to infertility as much as 51.2%. Approximately 27.5 million couples actively trying to conceive endure from infertility in India. [7, 8]

Several synthetic pharmacological agents are available for treating such reproductive disorders, but they are often associated with adverse effects and very limited long-term

benefits. This has led to a global interest in traditional herbal medicine, particularly in *Ayurvedic* classical formulations [9], which are considered relatively safer, holistic, potentially effective, and sustainable, with fewer side effects. These preparations are used for erectile dysfunction, a precise time-related effect, increasing performance and stamina, and enhancing the quality and count of sperm for getting offspring. Therefore, the exploration and scientific validation of these traditional *Ayurvedic* formulations are a need of the time. [10]

Among the various medicinal plants described in the classical *Ayurvedic* text, *Shalmali malabarica* holds a significant place due to its potential aphrodisiac property. In the *Ayurvedic* classical text, namely - *Bhaishajya Ratnavali*, *Vajikarana Adhyaya*, *Acharya* explains the Classical formulation of *Shalmali malabarica* - *Sidha Shalmali Kalpa* (SSK) [11] as an aphrodisiac herbo-mineral formulation, indicated for enhancing virility, strength, and reproductive health. It promotes sexual strength; even an eighty-year-old man can have sexual intercourse a hundred times after consuming it, but his penis will remain erect due to sexual vigor. [12]

All the ingredients of Classical *Shalmali malabarica* formulation are traditionally indicated for enhancing sexual strength, improving semen quality, and managing disorders like tissue depilation and erectile dysfunctions. [13] All herbal ingredients of this formulation are known for their nutritive, tonic, and rejuvenating properties, which collectively contribute to its efficacy as a potent aphrodisiac agent. [14] Despite its extensive mention in classical literature, there is limited availability of systematic scientific data regarding its pharmaceutical preparation, standardization, and analytical evaluation by modern parameters.

Rationale of the Present Study - Standardization of such herbo-mineral preparations is a critical step in ensuring their quality, safety, and therapeutic effectiveness. [15] Variability in raw materials, preparation methods, and storage conditions can significantly influence the pharmacological outcomes of

traditional formulations. In this context, pharmaceutical and analytical studies play an essential role in establishing reproducible preparation methods, recognizing physicochemical parameters, and ensuring the reliability of the final product. [16] Such a study also helps bridge the gap between ancient traditional knowledge and contemporary scientific validation, thereby facilitating wider acceptance of classical *Ayurvedic* formulation in the contemporary health care system. The present study was planned to prepare and standardize the Classical *Shalmali malabarica* formulation, with the objectives of developing a scientifically authenticated, reproducible, and quality-assured aphrodisiac preparation. This analytical research aims to contribute to the growing body of evidence supporting *Ayurvedic* therapeutics and to promote the integration of traditional formulation into contemporary clinical practice through rigorous Pharmaceutical-analytical evaluation.

Aims: To prepare and standardize the Classical *Shalmali malabarica* formulation (SSK) by using classical organoleptic parameters and modern analytical parameters in three batches – Batch A, B, and C

Objectives: To authenticate and standardize the raw ingredients of Classical *Shalmali malabarica* formulation (SSK) by using classical organoleptic parameters and modern analytical parameters, such as total ash, acid insoluble ash, loss on drying, water soluble extractive, alcohol soluble extractive, and pH.

To prepare the Classical *Shalmali malabarica* formulation (SSK) as per the classical methods mentioned in *Bhaishajya Ratnavali* in three batches – Batch A, B, and C

To standardize batch-wise prepared final - Classical *Shalmali malabarica* formulation (SSK) by using classical organoleptic parameters and modern analytical parameters, such as total ash, acid insoluble ash, loss on drying, water soluble extractive, alcohol soluble extractive, pH, and XRF.

2. MATERIAL AND METHODS

Sources of collection and authentication of all raw ingredients

All raw ingredients, required for the preparation of Classical *Shalmali malabarica* formulation (SSK) [17] namely - Purified Mercury (*Shuddha Parada*), [18] Purified Sulphur (*Shuddha Gandhaka*), [19] *Pueraria tuberosa* (*Bhukushmanda-Vidarikanda*), [20] *Curculigo orchioides* (*Talmuli-Krishna Musali*) [21], *Emblica officinalis* (*Dhatri-Amalaki*), [22] *Boerhavia diffusa* (*Punarnava*), [23] and for wet grinding (*Bhavana*) Decoction of *Shalmali malabarica* (*Shweta Shalmali Kwatha*), [24] Buffalo Milk (*Mahisha Dugdha*), [25] where obtained from the GMP certified, reliable and authentic source. All the raw herbs were identified and authenticated using classical and contemporary parameters at the Ayurveda Seva Sangh, Ayurved Mahavidyalaya, Nashik, Maharashtra.

Preparation of Classical *Shalmali malabarica* formulation (SSK)

Classical *Shalmali malabarica* formulation (SSK) was prepared in three batches – Batch-A, Batch-B, and Batch-C, as per the method mentioned in *Bhaishajya ratnavali* by following the subsequent steps -

Purification of Mercury (*Shodhan of Parada*) as per classical

methods: 250g of Mercury (*Parada*) was taken and mixed with an equal quantity of Lime Powder (*Sudha*) in *khalwayantra*, then triturated for 36 hours, and filtered through a double cloth. This mixture was washed with warm water until only Mercury (*Parada*) remained. [26, 27]

To this Mercury (*Parada*) add paste of Pilled Garlic (*Nitushka Rasana*). 250 g and 125 g quantities of salt (*Saindhav Lavana*) were continuously triturated (*Maradana*) until *Lasuna Kalka* turned black. Then this mixture was washed thoroughly (*Prakshalana*) with hot water until purified Mercury (*Shuddh Parada*) was collected. Purified Mercury was weighed and preserved for further use. Following the same method, Batch-B and Batch-C were also prepared.

Purification of Sulfur (*Shodhan of Gandhaka*) as per classical

methods: 250 g powdered Sulfur (*Gandhaka*) and an equal quantity of cow's ghee (*Goghrita*) (250 ml) were taken in a vessel and heated on a slow flame (*Mandagni*). An adequate

quantity of Cow's Milk (*Godugdha*) (750 ml) was taken in another vessel. Then, a piece of clean White cloth was tied on the mouth of this milk-containing vessel. After the totally melted Sulfur (*Gandhaka*) in cow's ghee (*Goghrita*) was poured into the vessel containing cow's milk through the cloth. [28, 29] Physical impurities were found on this cloth. After removing this cloth, a solid mass along with some granular part of Sulfur (*Gandhaka*) was taken out from the vessel containing cow's milk (*Godugdha*), then washed with hot water and dried in the shade. After drying, it was powdered, weighed, and kept for next use. Using the same procedure other batches (Batch-B and Batch-C) were prepared.

Preparation of Black Sulfide of Mercury (*Kajjali*) - Purified Mercury (*Shudha Parada*) 100g and Purified Sulfur (*Shudha Gandhaka*) 50 g were taken in a mortar and pestle (*Khalwayantra*) and triturated continuously till the disappearance of the white shine color of Mercury (*Parada*) and yellow color of Sulfur (*Gandhaka*), and a black coloured, smooth, very fine, lustreless powder of sulfide of Mercury was formed. This lustreless black color powder is then stored for

further use. Following the same method Batch-B and Batch-C of *Kajjali* were prepared. [30]

Preparation of Classical *Shalmali malabarica* formulation (*SSK*)

Fine powder of *Pueraria tuberosa* (*Bhukushmanda-Vidarikanda*), *Curculigo orchioides* (*Talmuli-Krishna Musali*), *Emblica officinalis* (*Dhatri-Amalaki*), *Boerhavia diffusa* (*Punarnava*) was taken in equal quantity – 50 g each (Total - 200 g) ([Table No – 1](#))

75 g of the prepared Black sulfide of Mercury (*Kajjali*) by using purified Mercury (*Shuddha Parada*) (50 g) and purified sulfur (*Shuddha Gandhaka*) (25 g) was taken.

A mixture of the above-mentioned herbal ingredients was then added to this Black sulfide of Mercury (*Kajjali*) and triturated well.

7 wet trituration (*Bhavana*) of each - Decoction of *Shalmali malabarica* (*Shweta Shalmali Kwatha*), Buffalo Milk (*Mahisha Dugdha*) was given (Total 14 *Bhavana*). Then this mixture was dried in the shade and kept in a clean glass bottle. [31]

The remaining batches Batch-B and Batch-C, were prepared by using the same method.

Table No.-1: Ingredients of Classical *Shalmali malabarica* formulation (*SSK*)

Sr. No.	Ingredient – Scientific Name (<i>Sanskrit</i> name – Common Name)	Properties (<i>Guna</i>)	Taste (<i>Rasa</i>)	Potency (<i>Veerya</i>)	After Taste (<i>Vipaka</i>)
1	Purified Mercury (<i>Shuddha Parada</i>)	<i>Snigdha, Sara, Guru</i>	<i>Shad Rasa</i>	<i>Ushna</i>	<i>Madhur</i>
2	Purified Sulphur (<i>Shuddha Gandhaka</i>)	<i>Ushna, Sara, Snigdha</i>	<i>Madhura, Katu, Tikta,</i>	<i>Ushna</i>	<i>Katu</i>
3	<i>Pueraria tuberosa</i> (<i>Bhukushmanda- Vidarikanda</i>)	<i>Snigdha, Guru</i>	<i>Madhur</i>	<i>Sheet</i>	<i>Madhur</i>
4	<i>Curculigo orchioides</i> (<i>Talmuli-Krishna Musali</i>)	<i>Guru, Picchil, Snigdha</i>	<i>Madhura, Tikta,</i>	<i>Ushna</i>	<i>Madhur</i>
5	<i>Emblica officinalis</i> (<i>Dhatri-Amalaki</i>)	<i>Guru, Ruksha, Sheet</i>	<i>Panchrasa (Amlapradhan- Lavana Rahita)</i>	<i>Sheet</i>	<i>Madhur</i>
6	<i>Boerhavia diffusa</i> (<i>Punarnava</i>)	<i>Laghu, Ruksha</i>	<i>Madhura, Tikta, Kashaya</i>	<i>Ushna</i>	<i>Madhur</i>
7	<i>Shalmali malabarica</i> (<i>Shweta Shalmali Kwatha</i>)	<i>Laghu, Picchil, Snigdha</i>	<i>Madhur</i>	<i>Sheet</i>	<i>Madhur</i>
8	Buffalo Milk (<i>Mahisha Dugdha</i>)	<i>Snigdha, Guru</i>	<i>Madhur</i>	<i>Sheet</i>	<i>Madhur</i>

3. OBSERVATION AND RESULT

Authentication of raw ingredients of Classical *Shalmali malabarica* formulation (*SSK*)– Identification of all herbal

ingredients done by using classical organoleptic parameters and modern analytical parameters ([Table No 2](#)) [32, 33]

Standardization of raw ingredients of Classical *Shalmali malabarica* formulation (SSK)– Identification of all herbal ingredients done by using modern analytical parameters such as total ash, acid in soluble ash, loss on drying, water soluble extractive, alcohol soluble extractive, pH, and specific gravity. (Table No 3) [34]

Purification of Mercury (*Parada Shodhana*) and Sulfur (*Gandhak Shodhana*)– This provided a systematic understanding of gradual changes in weight during the purification process of Mercury (*Parada*) and Sulfur (*Gandhak*) in three batches - Batch-A, B and C, respectively. (Table No. 4)

Preparation of Black Sulfide of Mercury (*Kajjali*) – Three batches (A, B and C) of *Kajjali* were to evaluate the reproducibility of the procedure. The final quantity obtained, eight loss and percentage yield were recorded for each batch. (Table No. 5)

Preparation of Classical *Shalmali malabarica* formulation (SSK) Three batches (A, B and C) of SSK were prepared by following same procedure. The final weight gain and percentage yield were recorded to assess the consistency and reproducibility of the process. (Table No. 6)

Table No. 2: Authentication of each raw ingredient as per classical and contemporary organoleptic parameters

Ingredients	Part used	Quantity	Color (Varna)	Odor (Gandha)	Nature (Sparsha)	Taste (Rasa)
<i>Pueraria tuberosa</i> (<i>Bhukushmanda-Vidarikanda</i>)	Root – Fine powder	50 g	Yellowish White (<i>Shveta</i>)	Characteristic (<i>Madhura Gandhi</i>)	Rough Fine Powder (<i>Kshlakshna</i>)	Sweet (<i>Madhura</i>)
<i>Curculigo orchioides</i> (<i>Talmuli-Krishna Musali</i>)	Root – Fine powder	50 g	Blackish Gray (<i>Krushna</i>)	Characteristic (<i>Madhura Gandhi</i>)	Rough Hard Powder (<i>Kshlakshna</i>)	Bitter (<i>Madhura Tikta</i>)
<i>Emblica officinalis</i> (<i>Dhatri-Amalaki</i>)	Fruit – Fine powder	50 g	Yellowish Green (<i>Pitabha</i>)	Characteristic (<i>Amla Gandhi</i>)	Rough Hard Powder (<i>Kshlakshna</i>)	Sour, Bitter, Astringent (<i>Lavan Varjit Pancharasa</i>)
<i>Boerhavia diffusa</i> (<i>Punarnava</i>)	Root – Fine powder	50 g	Brownish Yellow (<i>Shetabh- krushna</i>)	Characteristic (<i>Madhura Gandhi</i>)	Rough Hard Powder (<i>Kshlakshna</i>)	Sweet, Bitter, Pungent (<i>Madhura, Tikta, Kashya</i>)
Decoction of <i>Shalmali Malabarica</i> (<i>Shweta Shalmali Kwatha</i>)	Root Kwatha <i>Bhavana Dravya</i>	200 ml X7 <i>bhavana</i>	Brown (<i>Rakta bha</i>)	Characteristic (<i>Madhura Gandhi</i>)	Rough Fine Powder (<i>Kshlakshna</i>)	Sweet, Bitter, Pungent (<i>Madhura, Tikta, Kashya</i>)
Buffalo Milk (<i>Mahisha Dugdha</i>)	<i>Bhavana Dravya</i>	150 ml X7 <i>Bhavana</i>	White (<i>Shveta</i>)	Charac-teristic (<i>Madhura Gandhi</i>)	Thin Flowing Consistency (<i>Kshlakshna</i>)	Sweet (<i>Madhura</i>)

Table No. 3: Standardization of herbal raw ingredient as per Modern parameters

Ingredients	Total Ash	Acid Insoluble Ash	Loss on drying	Water Soluble Extractive	Alcohol Soluble Extractive	pH	Specific Gravity
<i>Pueraria tuberosa</i> (<i>Vidarikanda</i>)	4.1 %	0.39 %	8 %	32.7 %	14.5 %	5.2 %	--
<i>Curculigo orchioides</i> (<i>Krishna Musali</i>)	7.89 %	0.9 %	10.42 %	11.37 %	15.4 %	5.03 %	--
<i>Emblica officinalis</i> (<i>Dhatri-Amalaki</i>)	5.95 %	1.6 %	8.2 %	54.3 %	45.6 %	5.2 %	--
<i>Boerhavia diffusa</i> (<i>Punarnava</i>)	12.10 %	3.4 %	10.86 %	16.5 %	8.35 %	6.3 %	--
Decoction of <i>Shalmali Malabarica</i>	8.11%	1.6 %	7.93 %	14.38 %	8.55 %	4.59 %	--
Buffalo Milk (<i>Mahisha Dugdha</i>)	--	--	--	--	--	6.8 %	1.0401

Table No. 4: Purification of Mercury (*Parada Shodhana*) and Sulfur (*Gandhak Shodhana*)

Purification of Mercury (<i>Parada Shodhana</i>)					
Batch	Initial quantity		Final quantity	Weight loss	% of Yield
Batch A	Mercury (<i>Parada</i>) - 250 g; Lime Powder (<i>Sudha</i>) - 250 g; Paste of Pilled Garlic (<i>Nitushka Rasona</i>) - 250 g; Salt (<i>Saindhav Lavana</i>) - 125 g		Mercury (<i>Parada</i>) – 230 g	20 g	8 %
Batch B	Mercury (<i>Parada</i>) - 250 g; Lime Powder (<i>Sudha</i>) -250 g; Paste of Pilled Garlic (<i>Nitushka Rasona</i>) - 250 g; Salt (<i>Saindhav Lavana</i>) - 125 g		Mercury (<i>Parada</i>) – 210 g	30 g	12 %
Batch C	Mercury (<i>Parada</i>) - 250 g; Lime Powder (<i>Sudha</i>) - 250 g; Paste of Pilled Garlic (<i>Nitushka Rasona</i>) - 250 g; Salt (<i>Saindhav Lavana</i>) - 125 g		Mercury (<i>Parada</i>) – 225 g	25 g	10 %
Purification of Sulfur (<i>Gandhak Shodhana</i>)					
Batch A	Sulfur (<i>Gandhak</i>) - 250 g; Cow’s ghee (<i>Goghruta</i>) - 250 g Cow’s Milk (<i>Godugdha</i>) - 750 ml		Sulfur (<i>Gandhak</i>)- 240 g	10 g	4 %
Batch B	Sulfur (<i>Gandhak</i>) - 250 g; Cow’s ghee (<i>Goghruta</i>) - 250 g Cow’s Milk (<i>Godugdha</i>) - 750 ml		Sulfur (<i>Gandhak</i>)- 230 g	20g	8 %
Batch C	Sulfur (<i>Gandhak</i>) - 250 g; Cow’s ghee (<i>Goghruta</i>) - 250 g Cow’s Milk (<i>Godugdha</i>) - 750 ml		Sulfur (<i>Gandhak</i>)- 235 g	15 g	6 %

Table No. 5: Preparation of Black Sulfide of Mercury (*Kajjal*)

Batch	Initial quantity		Final quantity	Weight loss	% of Yield
Batch A	Purified Mercury (<i>Shudha Parada</i>) - Purified Sulfur (<i>Shudha Gandhaka</i>)	100 g- 50 g	140	10 g	6.6 %
Batch B	Purified Mercury (<i>Shudha Parada</i>) - Purified Sulfur (<i>Shudha Gandhaka</i>)	100 g- 50 g	130	20 g	13.3 %
Batch C	Purified Mercury (<i>Shudha Parada</i>) - Purified Sulfur (<i>Shudha Gandhaka</i>)	100 g- 50 g	130	20 g	13.3 %

Table No. 6: Preparation of Classical *Shalmali malabarica* formulation (SSK)

Parameters	Batch A	Batch B	Batch C
Initial quantity	Black sulfide of Mercury (<i>Kajjali</i>) –75 g, Four herbal ingredients – 50 g - total –275 g		
Shalmali Kwath – 7 Bhavana	200 ml each Bhavana	200 ml each Bhavana	200 ml each Bhavana
Mahisha Dugdha – 7 Bhavana	150 ml each Bhavana	150 ml each Bhavana	150 ml each Bhavana
Final quantity	305 g	300 g	305 g
Weight gained	30 g	25 g	30 g
% of Yield	10.9%	9.09 %	10.9%

The organoleptic observations during the preparation of three batches (A, B and C) of Classical *Shalmali malabarica* formulation (SSK) were carried out throughout seven wet trituration (*Bhavana*) cycles. ([Table No – 7 & 8](#)). [32. 33]

Analytical study of Classical *Shalmali malabarica* formulation (SSK): A physicochemical analytical study of the classical

Shalmali malabarica formulation (*Siddh Shalmali kalp*) prepared in three batches (A, B and C), was carried out using organoleptic parameters and procedures for determining Total Ash, Acid insoluble ash, Loss on Drying, Water-insoluble Extractive, Alcohol-insoluble Extractive, pH, and XRF. The observations were summarized ([Table No. 9](#)). [34]

Table No. 7: Organoleptic observation of Classical *Shalmali malabarica* formulation (SSK)– Batch – A, B, and C during 7 wet trituration (Bhavana) with Decoction of *Shalmali malabarica* (Shweta *Shalmali Kwatha*)

Bhavana No.	Colour	Odor	Texture	Touch
Initial	Dull black	Mild sulfur odor	slightly coarse	Slightly gritty
1st	Deep black	Mild odor	Finer than initial	Less gritty
2nd	Uniform black	Astringent smell	Smooth	Soft on rubbing
3rd	Intense black	Mild herbal odor	Very fine	Smooth
4th	deep black	Medium herbal odor	Very fine, cohesive	Non-gritty
5th	Jet black	Medium herbal odor	Extremely fine	Silky
6th	Deepest black	Characteristic odor	Highly smooth	Very soft
7th	Uniform jet black	Characteristic odor	Ultra-fine	Extremely smooth, silky

Table No. 8: Organoleptic observation of Classical *Shalmali malabarica* formulation (SSK) Batch – A, B, and C – during 7 wet trituration (Bhavana) with Buffalo Milk (*Mahisha Dugdha*)

Bhavana No.	Colour	Odor	Texture	Touch
Initial	Uniform jet black	Characteristic odor	Ultra-fine	Gritty
1st	Black	Mild milky odor	Slightly smooth	Less gritty
2nd	Deep black	Mild sweet odor	Smooth	Soft
3rd	Intense black	Pleasant milky smell	Very fine	Smooth, unctuous
4th	Stable black	Faint milk odor	Fine and soft	Slightly unctuous
5th	Jet black	Very mild odor	Extremely fine	Silky, smooth
6th	Deep jet black	Characteristic odor	Highly smooth	Soft and mildly unctuous
7th	Uniform intense black	Characteristic odor	Ultra-fine	Extremely smooth, soft

Table No. 9: Physicochemical Parameters of Classical *Shalmali malabarica* formulation (SSK)

Test Parameters	Result - SSK		
	Batch A	Batch B	Batch C
Color (Varna)	Krushnabha Churna	Krushnabha Churna	Krushnabha Churna
Teats Rasa	MadhurAmla	MadhurAmla	MadhurAmla
Sparsha Touch	Kshlakshna	Kshlakshna	Kshlakshna
Odor Gandha	Ugra Gandhi	Ugra Gandhi	Ugra Gandhi
Total Ash	15.7 %	16.66 %	16.12 %
Acid Insoluble Ash	8.02 %	8.3 %	8.19 %
Loss on drying	12.05 %	12.39 %	12.2 %
Water Soluble Extractive	1.32 %	1.65 %	1.28 %
Alcohol Soluble Extractive	1.8 %	2 %	1.75 %
pH	4.01 %	4.1 %	4.1 %

XRF Analysis of Classical *Shalmali malabarica* formulation (SSK) prepared in three batches - Batch A, B, and C –

The Classical *Shalmali malabarica* formulation (SSK) contains major inorganic constituents, such as SO₂ and HgO, suggesting a mineral-rich nature. Mercury is present in a bound, non-toxic form with Sulfur, and proper incorporation of Mercury and Sulfur. Essential elements like K and Ca. Mg. P. Fe and Z support therapeutic aphrodisiac activity and nutritive value. Trace levels of Pb. As Sb is within the permissible limits. [35]

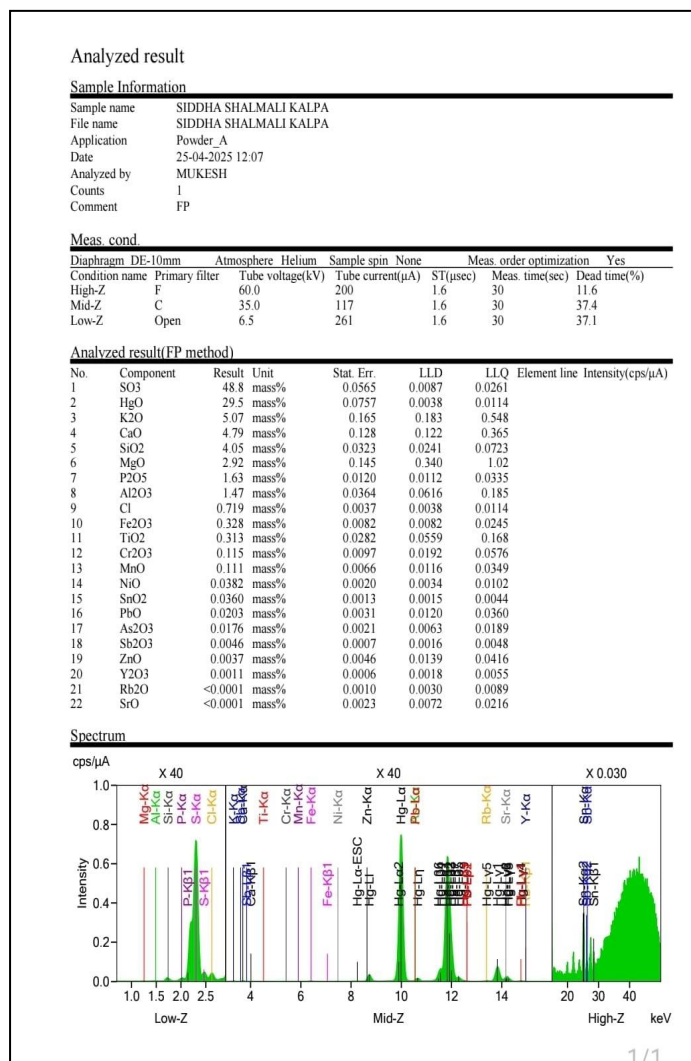


Fig. 1 :XRF Analysis of Classical Shalmali malabarica formulation (SSK)

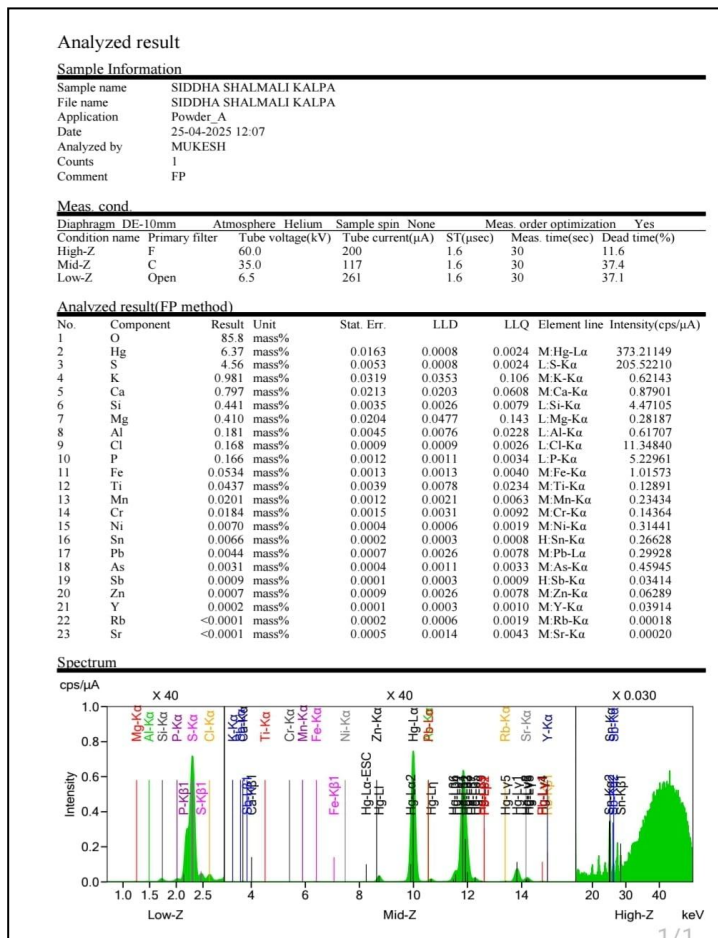


Fig. 2: XRF Analysis of Classical Shalmali malabarica formulation (SSK)

4. DISCUSSION

Selection of raw ingredients - All the raw ingredients required for the Classical *Shalmali malabarica* formulation (SSK) were selected based on classical Ayurvedic references in *Bhaishajya ratnavali*, where each constituent of this formulation is described for its specific action in Aphrodisiac therapy (*Vajikaran* therapy). The formulation consists of both mineral and plant-based ingredients, combined to achieve a synergistic effect on male reproductive health, and purified (*Shodhit*) Mercury (*Parada*) and Sulfur (*Gandhaka*) from the mineral base of the preparation. Proper scientific purification (*shodhana*) of these ingredients ensures the safety and assists the therapeutic potential of the preparation.

Between the herbal ingredients of this formulation, *Bhukushmanda* (*Pueraria tuberosa*) and *Krishna Musali* (*Curculigo orchoides*) are well known for their Balya and *Vajikarana* properties. These ingredients are traditionally used to enhance strength, vitality, and reproductive functions. *Dhatri* (*Amalaki* - *Emblica officinalis*) is a well-known rejuvenative (*Rasayana*) drug that influences tissue nourishment, longevity, and vitality. At the same time, *Punarnava* (*Boerhavia diffusa*) maintains cellular metabolic processes and systemic balance.

Decoction of *Shwet Shalmali* (*Shalmali malabarica*) is used for wet grinding (*Bhavana*), which plays a core role in the preparation and is traditionally indicated in various reproductive disorders. This wet grinding (*Bhavana*) process is intended to increase the formulation's therapeutic potential and facilitate better integration of its other ingredients.

The use of fine powder (*Shlakshna churna*) of all the herbal ingredients ensures uniform mixing and enhanced absorption. The equal quantity (50 g) of all herbal ingredients helps maintain the balance in the pharmacological action of the formulation. At the same time, the greater preparation of Black sulfide of Mercury (*Kajjali*) (75 g) supports proper formulation preparation. It enhances the stability, bioavailability, and therapeutic potential of the other combined ingredient as well. Thus, the selection of all ingredients reflects a well-planned classical formulation aimed at supporting nourishment, rejuvenation, and enhancement of male reproductive function through an aphrodisiac action.

Authentication of raw ingredients by Organoleptic Physico – chemical parameters –

Authentication of all raw ingredients is an essential step to ensure the identity and genuineness of each ingredient. In the analytical study, all required ingredients were standardized using classical and contemporary parameters.

Bhukushmanda (*Pueraria tuberosa*) has a yellowish-white color with a sweet taste. *Talmuli* (*Curculigo orchoides*) exhibited a blackish grey appearance with a bitter taste. *Dhaatri* (*Emblica*

officinalis) displayed a yellowish-green color with a sour, bitter, and astringent taste, whereas *Punarnava* (*Boerhavia diffusa*) and *Shweta Shalmali* (*Shalmali malabarica*) showed a characteristic brownish shade with a predominantly bitter taste. *Mahisha dugdha* (Buffalo milk) was whitish in appearance, with a sweet taste and a thin, flowing consistency. These classical and contemporary organoleptic characteristics indicate the presence of specific phytoconstituents and support the proper authentication of all raw ingredients.

All observed organoleptic features of each ingredient were consistent with classical and contemporary descriptions, confirming their authenticity, quality, and purity.

The Total Ash value indicated the total inorganic content, with *Punarnava* (*Boerhavia diffusa*) showing a competitively higher Ash value, indicating a greater mineral composition.

Acid-insoluble Ash values for all raw ingredients are within acceptable limits, suggesting minimal contamination with silica or earthy matter.

Loss-on-drying values indicated acceptable moisture content, suggesting proper drying and a reduced risk of microbial growth and degradation.

Extractive values provided important insights into the solubility of the active constituents. *Dhatri* (*Emblica officinalis*) exhibited significantly higher values of water- and alcohol-soluble extractives, which may be attributed to the presence of specific elements such as tannins, vitamin C, and other polar compounds. *Bhukushmand* (*Pueraria tuberosa*) also showed high levels of water-soluble extractives, suggesting the presence of carbohydrates and other nutritive components. *Talmuli* (*Curculigo orchoides*) showed a comparatively higher value for alcohol-soluble extractives, indicating the presence of moderately polar bioactive compounds. *Punarnava* (*Boerhavia diffusa*) and *Shweta Shalmali* (*Shalmali malabarica*) exhibit moderate extractive values, reflecting their divergent phytochemical compositions.

The pH values of all the raw ingredients ranged from mildly acidic to near neutral, which may influence stability and compatibility during preparation. Buffalo milk (*Mahisha dugdha*) exhibited a slightly higher pH and a Specific gravity of 1.0401, consistent with its liquid nature and nutritional composition.

Thus, the analytical assessment, carried out using classical parameters and modern analytical methods, confirms the identity, purity, quality, and stability of all ingredients. This is a dual approach to ensure the reliability of raw ingredients and provides strong scientific evidence for the preparation of a standardized and effective Classical *Shalmali malabarica* formulation (SSK).

Preparation of Classical *Shalmali malabarica* formulation (SSK) prepared in three batches A, B, and C -

The presence of *Kajjali* as a core and stable compound is significant, which may facilitate drug delivery and enhance the therapeutic efficacy of the classical *Shalmali malabarica* formulation (SSK). The homogeneous nature of the *Kajjali* suggests proper processing, which is essential for the stability and safety of the final formulation. The interaction of herbal and mineral constituents results in a stable matrix, ensuring even distribution of active components. The repeated wet grinding (*Bhavana*) process can be considered as a bio-enhancement step, promoting better binding, uniformity, and assimilation of active principles. The use of *Shweta Shalmali* (*Shalmali malabarica*) and buffalo milk (*Mahisha Dugdha*) in the grinding process may further support targeted action on the reproductive system at the cellular level and help improve the assimilation of nutrients and bioactive compounds.

A controlled drying procedure helps preserve sensitive components and prevents further microbial contamination, whereas proper storage maintains stability and prevents contamination. Overall, the prepared final formulation reflects a scientifically relevant pharmaceutical approach, where traditional processing techniques contribute to enhancing stability, homogeneity, purity, and potential therapeutic efficacy.

Standardization of Classical *Shalmali malabarica* formulation (SSK) prepared in three batches –

The analytical assessment of the final prepaid Classical *Shalmali malabarica* formulation (SSK) based on classical parameters confirms its characteristic features. The noted blackish color (*Krishnabha Varna*) suggests proper amalgamation (*Kajjali*) and uniform mixing of all herbo-mineral components. The Sweet and Sour (*Madhura* and *Amla*) rasa indicates the combined influence of herbal ingredients and *Bhavana dravyas*, reflecting its mildly acidic nature and nutritive potential. The smooth texture (*Shlakshna sparsha*) of the formulation suggests a fine particle size, proper trituration, and homogeneity, whereas the presence of typical *Gandhaka* characteristics as a constituent indicates its presence.

Physico-chemical analysis of the final formulation using contemporary parameters further supports its quality and stability.

The total Ash value indicates the presence of inorganic and mineral components, which are predictable in a herbo-mineral preparation. The acid-insoluble ash indicates a moderate amount of siliceous matter within an acceptable range.

The loss on drying indicates the formulation's moisture content and indicates adequate drying, both of which are important for stability and the prevention of microbial contamination.

The extractive values provide insight into the solubility of active components; lower values of water and alcohol-soluble extractives may be reflected in the dominance of mineral content in the preparation, along with selective extraction of phyto-constituent

The pH suggests a mildly acidic nature, which influences the stability and absorption of the preparation. An analytical assessment based on both classical and contemporary parameters confirms the authenticity, proper processing, and acceptable quality of the Classical *Shalmali malabarica* formulation (SSK), supporting its suitability for further scientific evaluation.

XRF: Elemental analysis of the Classical *Shalmali malabarica* formulation (SSK) prepared in three batches, revealed a well-defined herbo-mineral composition, supporting proper pharmaceutical processing and formulation reliability. The presence of these major inorganic constituents, such as SO₂ and HgO, suggests successful incorporation of *Gandhaka* and *Parada*, which are important components of their amalgamation – *Kajjali*.

Mercury (*Parada*) was found bound to Sulfur (*Gandhaka*), indicating a stable sulfide complex. This is significant from a safety perspective, as the binding reduces the toxicity of Mercury's radicals and increases its compatibility in the formulation. The presence of an adequate quantity of Sulfur (*Gandhaka*) confirms the proper formation of *Kajjali* and contributes to the chemical stabilization of the formulation.

The presence of essential micronutrients, such as potassium, calcium, magnesium, and phosphorus, indicates the formulation's nutritive value. These elements all play an important role in physiological functions and may support reproductive health. Trace elements iron and zinc, detected, are within therapeutic limits. These trace elements are known to be associated with spermatogenesis, helping correct hormonal balance and increase overall vitality.

Heavy metals such as lead, arsenic, and antimony were detected only at trace levels within permissible limits, indicating that the purification (*Shodhana*) process and preparation were effective in confirming the safety of the classical formulation.

The contribution of herbal ingredients is reflected in the overall elemental profile, suggesting the proper integration of phytoconstituents with mineral components and tree elements. The classical formulation exhibits a stable, homogeneous herbo-mineral matrix, which is essential for maintaining consistency and therapeutic efficacy.

The findings obtained from the overall analytical study indicate that the Classical *Shalmali malabarica* formulation (SSK) is

chemically stable, safe within the prescribed dose, and possesses a balanced herbo-mineral composition. This reflects its therapeutic potential as an effective, mineral-rich, aphrodisiac formulation.

Limitation of the Study

This study primarily focused on the pharmaceutical preparation and analytical assessment, but detailed pharmacological and clinical assessments of this formulation are not included.

The findings from this analytical study are based on small-scale laboratory preparation, which may differ from those in large-scale manufacturing.

Advanced analytical techniques were not extensively used here for the identification of individual active constituents.

The formulation's long-term stability (shelf life) is not evaluated in the study.

The exact mechanism of action of the preparation is not explored at the cellular level.

5. CONCLUSION

The batch-wise preparatory study of *Shalmali malabarica* formulation (SSK) is conducted as per classical guidelines explained in *Bhaishajya Ratnavali* and the analytical standardization of *Shalmali malabarica* formulation (SSK) carried out as per classical and contemporary parameters of Classical *Shalmali malabarica* formulation (SSK) a potential aphrodisiac preparation.

The organoleptic assessment of the Classical *Shalmali malabarica* formulation (SSK) prepared in three batches revealed its characteristic classical parameters as blackish blue color (*Krishnabha varna*), sweet and sour taste (*Madhur Amla Rasa*), smooth feel (*Shlakshna Sparsha*), and strong smell (*Uragrandhi*). This confirms its identity as described in the classical literature.

Physico-chemical analysis of the Classical *Shalmali malabarica* formulation (SSK) in three batches suggested that the preparation met all contemporary parameters, such as Ash

value, pH, etc., indicating proper processing and the production of an authentic, suitable, and standard final product.

Further XRF analysis confirmed the presence of essential inorganic elements, such as Sulfur and Mercury, in a specific and stable form, authenticating the proper preparation of Black sulfide of Mercury (*Kajjali*). The presence of trace and micro-essential nutrients such as calcium, magnesium, iron, and zinc validates the therapeutic and nutritional relevance of this Classical *Shalmali malabarica* formulation (*SSK*). All heavy metals were within permissible limits, suggesting the safety and effectiveness of this preparation.

Overall, physicochemical analysis and XRF of the Classical *Shalmali malabarica* formulation (*SSK*) in three batches confirm that, by following classical guidelines, the prepared formulation is stable, authentic, standard, safe, and effective. Thus, this study has generated preliminary analytical data that may be useful for further analytical authentication of this type of potential aphrodisiac preparation. This analytical study not only validates the traditional preparation but also opens new possibilities for developing it for the modern world, specifically in the field of Reproductive health and sexual wellness.

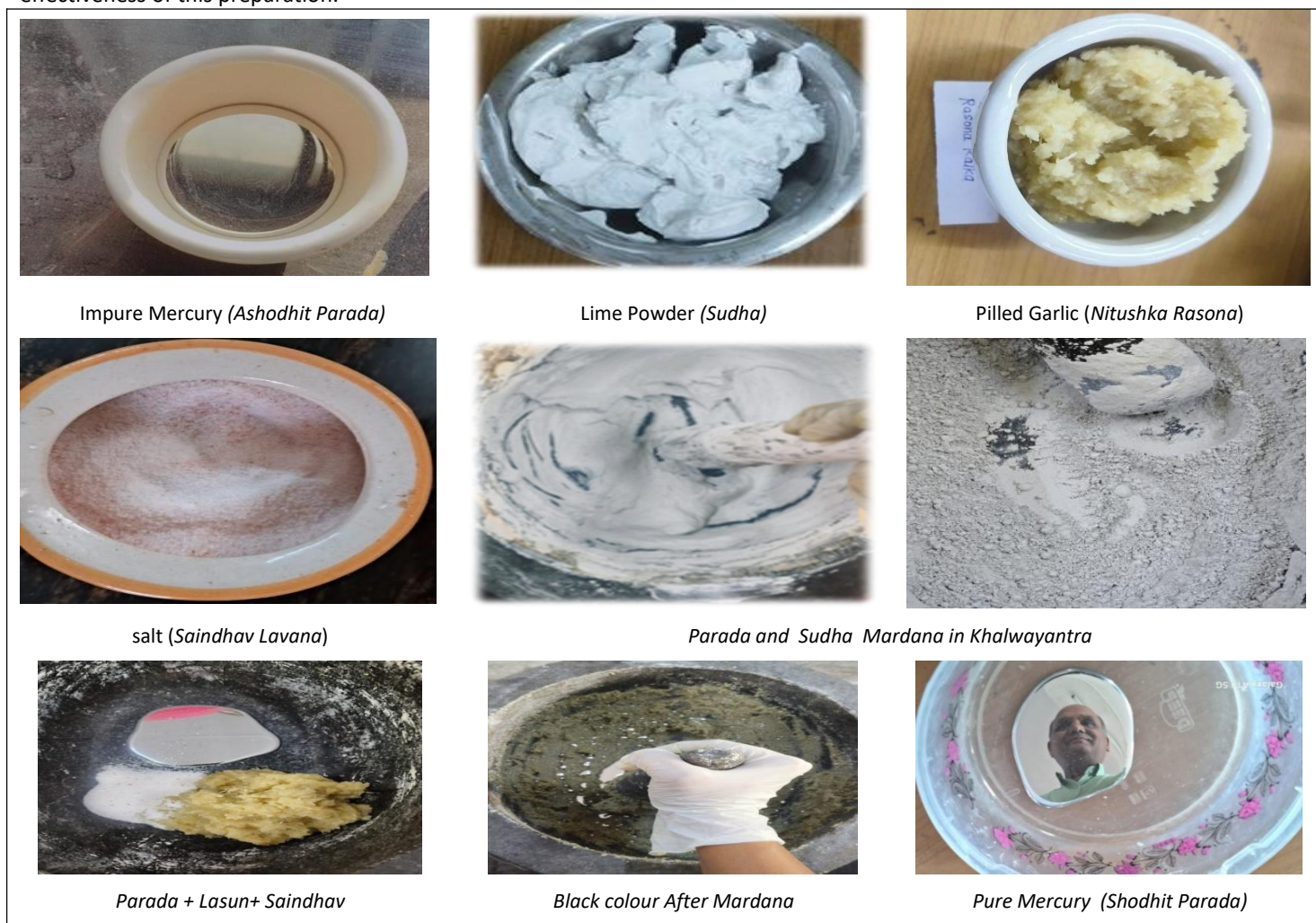


Fig. No. 03 Purification of Mercury (*Shodhan of Parada*)



Fig. No. - 04 Purification of Sulfur (*Shodhan of Gandhaka*)

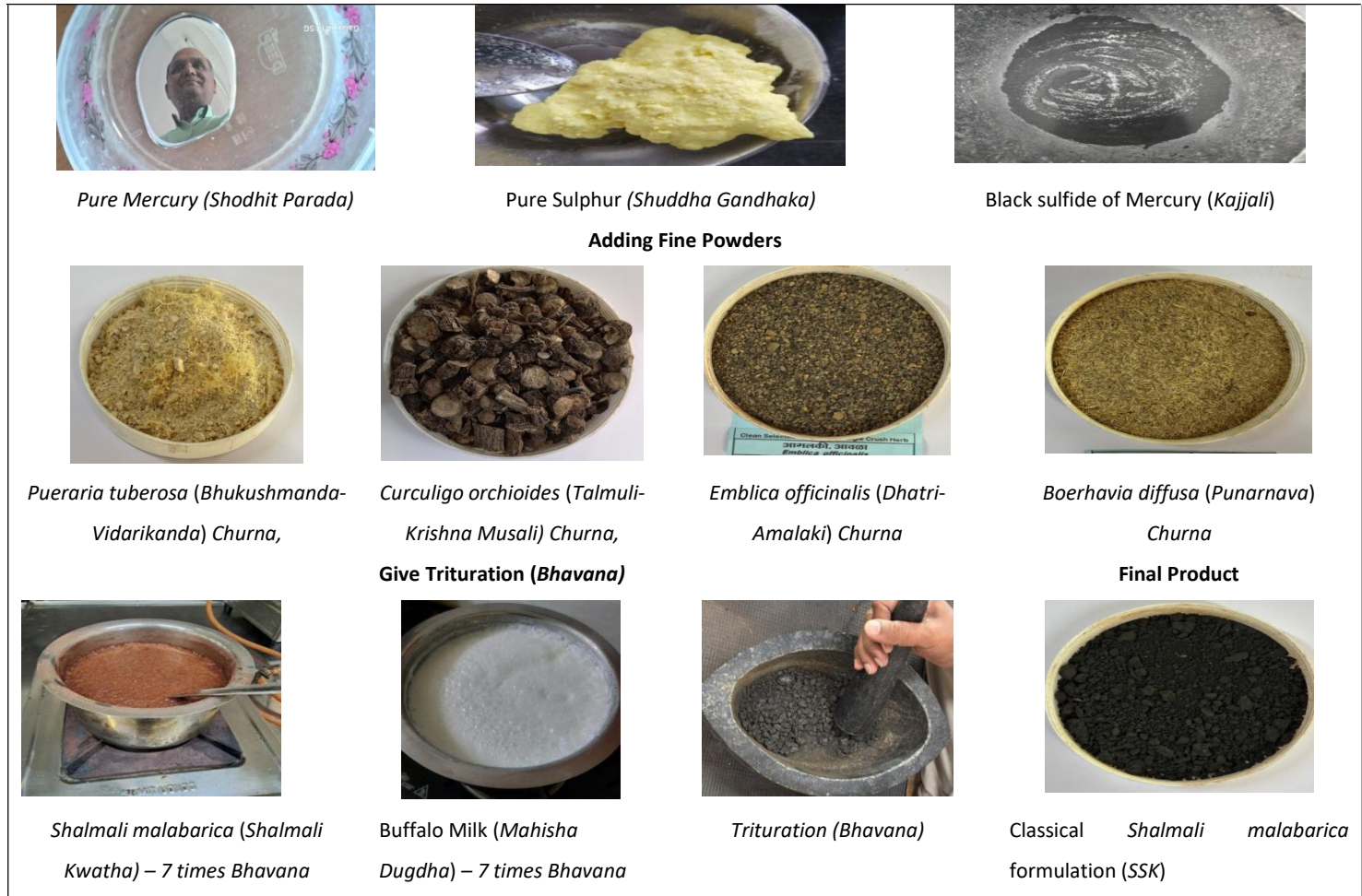


Fig. No. 05 Preparation of Classical *Shalmali malabarica* formulation (*SSK*)

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Declaration of Generative AI

The authors declare this manuscript was written without the use of generative artificial intelligence tools. All the content, including text generation, data analysis and references was developed and reviewed by the author without assistance from AI technologies.

Conflict of Interest – The authors declare no conflicts of interest.

Source of Support – The authors declare no source of support.

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