

Physicochemical Analysis of Saptamrita Rasa

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Received on: 31-05-2022

Accepted: 13-08-2022

Corrected: 25-08-2022

Background: *Saptamrita rasa is an important formulation used in all types of diseases of mouth. Its composition includes minerals and metals along with herbs as Parada bhasma, Abhraka bhasma, Loha bhasma, Suddha (purified) Shilajita, Suddha Guggulu, Suddha Manahshila and Swarnamakshika bhasma. Analysis based on pharmacopoeial standards and quantitative estimation of elements present with formulation are required.*

2. Materials and Methods: *The physicochemical analysis consists of organoleptic evaluation, ash values, extractive values, pH, preliminary phytochemical tests, fluorescence tests, thin layer chromatography and quantitative estimation of minerals and metals.*

3. Result: *Total ash was noted 46.05% while the pH was 5.94. Carbohydrates, tannin, flavonoids and other compounds were present. 11 spots were noted in thin layer chromatography with specified solvent system. The particle size was noted in range of 2 μ m to 40 μ m. The quantitative estimation of minerals and metals exhibited 12.25% mercury, 6.25% arsenic and 5.85% iron. Other elements were comparatively lower in quantity.*

4: Discussion and Conclusion: *Higher ash values and lower extractive values are due to minerals and metals present with the formulation. Greater quantity of mercury and iron are due to parada bhasma and abhraka bhasma. Manhashila attributed to the increased quantity of arsenic.*

Keywords: Saptamrita rasa, Parada, Abhraka, Loha, Shilajita, Guggulu, Manahshila, Swarnamakshika, Analysis.....

Mineral and metals are parts of various formulations of Ayurveda. Many of these mineral and metal drugs are processed with herbs to bring in herbomineral forms. Bhasma preparations are important among formulations of minerals and metals. They are prepared with mechanical energy transfer using shodhana (purification) followed by heat treatment as per puta requirements¹. This is suggested to be ancient nanotechnology technique to reduce the size of elements¹. With present innovations of nanotechnology greater prospects of mineral and metal drugs are opened². Various bhasmas are used medicinally for diversified physiological problems. Some preparations include combination of bhasmas and herbal parts as *Saptamrita Rasa*. It is prescribed in all types of diseases of mouth³.

Saptamrita rasa is combination of *Parada bhasma, Abhraka bhasma, Loha bhasma, Suddha (purified) Shilajita, Suddha Guggulu, Suddha Manahshila* and *Swarnamakshika bhasma*. These ingredients contain various elements as mercury, iron, copper, arsenic, magnesium, silicon, aluminium and potassium. Numbers of works have been separately done for medicinal uses of these elements as in a cross-sectional study on processed mercury consumption at the dose of 130 μ g/kg/day, no adverse effects, but beneficial effects were reported⁴. Iron is essential for various physiological functions from cellular to organism level⁵. The diversity of function depends upon bond formation and adjacent ligands or on overall complex formation with proteins and other biomolecules⁶. Evidences on wound healing and antimicrobial effects of copper are also present⁷. Utilization of nanotechnology allows copper

to achieve diversified shape and make specific complexes important for different clinical applications⁸. Arsenic trioxide is approved drug for promyelocytic leukaemia². Arsenic sulphide inhibits prostate cancer proliferation by targeting large tumour suppressor kinase 2 (LATS2)⁹. Sulphur in different forms are suggested for depression, diabetes, interstitial cystitis, cancer etc.¹⁰ Magnesium is an essential element needed for various enzymatic actions. It is also used in headache, migraine, diabetes, asthma etc.¹¹ Silicon is important for immune health, bone mineralization, collagen synthesis etc.¹² Aluminium is used as an adjuvant in vaccines, antacids, hemorrhoidal medications etc.¹³ Potassium is important electrolyte required for health of heart and bone.

Medicinal properties and probable side-effects of these elements are dose-dependent. The dose of *Saptamrita rasa* is mentioned as 800 mg- 1000 mg³. The quantity of elements in prescribed dose is vital to find out the effects of these elements separately or in combined forms. Hence, physico-chemical analysis of *Saptamrita rasa* was selected for the study.

2. Materials and Methods

Parada bhasma, *Abhraka bhasma*, *Loha bhasma*, *Suddha* (purified) *Shilajita*, *Suddha Guggulu*, *Suddha Manahshila* and *Swarnamakshika bhasma* were procured from Bhanu Healthcare, Hubli. All ingredients were mixed one after other in sequence. The mixture was triturated well using mortar and pestle to get the homogenous blend³. Thereafter, it was passed through sieve number 44 (mesh aperture of 355 μ m).

Photo No.: 1
Showing mixing through trituration



The complete analysis was done in Quality Control Laboratories, ALNRMAMC, Koppa. All chemicals used for analysis were from *HIMEDIA*. Organoleptic characters were evaluated for colour, taste, odour and appearance. The procedures for loss on drying at 105°C, total ash, acid insoluble ash, water soluble extractives and alcohol soluble extractives were used as per given in *Ayurvedic Pharmacopoeia of India*¹⁴. pH was determined for 10% aqueous solution using microprocessor digital pH meter of *Systronics*. Preliminary phytochemical analysis was done for hydroalcoholic extract^{15,16}. Fluorescence studies of powder was done using 10% of acids and alkalis. The microscopical method was used to measure the particle size using fluorescent microscope with camera from *Dewinter*. The quantitative analysis of potassium and calcium was done on flame photometer 128 of *Systronics*. The quantity of mercury¹⁷, arsenic¹⁸, iron¹⁹, copper²⁰, aluminium²¹, silica²², magnesium²³ and sulfur²⁴ was determined by gravimetric and volumetric methods. Thin layer chromatography was done on silica coated plates. The solvent system used was toluene and ethyl acetate in ratio of 8: 2.

3. Result

3.1. Physico-chemical Parameters: The result is shown in table number: 1.

Table Number: 1

Moisture content	: 1.26%
Total ash	: 46.05%

Acid insoluble ash	: 30.74%
Water soluble extractives	: 6.28%
Alcohol soluble extractives	: 7.34%
pH	: 5.94 ± 0.10

3.2: Preliminary Phytochemical Test: The result of preliminary phytochemical tests are shown in table number: 2

Table Number: 2

Phytochemical constituents	Present/Absent
Carbohydrates	Present
Tannin	Present
Terpenoids	Present
Flavonoid	Present
Saponin	Present
Alkaloids	Present

3.3.: Fluorescence test: The result is shown in table number: 3.

Table Number: 3

Powder and solvent	Under visible light	Under long UV
Powder + water	Brown red	Fluorescent green
Powder + alcohol	Reddish-grey	Fluorescent yellow
Powder + 10% NaOH	Dark brown	Fluorescent green
Powder + 10% NH ₃	Dark maroon	Fluorescent green
Powder + 10% HCl	Light maroon	Fluorescent green
Powder + 10% H ₂ SO ₄	Light brown	Fluorescent yellow
Powder + 10% HNO ₃	Greyish-red	Fluorescent green

3.4.: Particle size: The size of particles was observed in range of 2µm to 40 µm (Photo number: 2).

3.5.: Quantitative estimation: The quantitative estimation of various elements is shown in table number:4.

Table Number: 4

Element	Quantity (in percentage)
Mercury	12.25%
Arsenic	6.25%
Iron	5.85%
Sulfur	4.42%
Aluminium	2.62%
Silica	2.12%
Potassium	1.45%
Calcium	1.15%
Magnesium	1.12%
Copper	0.95%

3.6: Thin layer chromatography: The Rf values noted under visible light and under long UV are shown in table number: 5 (Photo number: 3).

Table Number: 5

Rf values	Under visible light	Under long UV
0.02	Green	Bright fluorescent greenish yellow
0.05	---	Bright fluorescent cream
0.07	---	Bright fluorescent cream
0.11	Orange	Fluorescent green
0.18	Light yellow	Fluorescent green
0.35	---	Fluorescent green
0.47	---	Fluorescent green
0.55	---	Fluorescent green
0.71	---	Fluorescent blue
0.81	---	Fluorescent blue
0.88	---	Fluorescent green

Photo Number: 2
Showing Particle Size

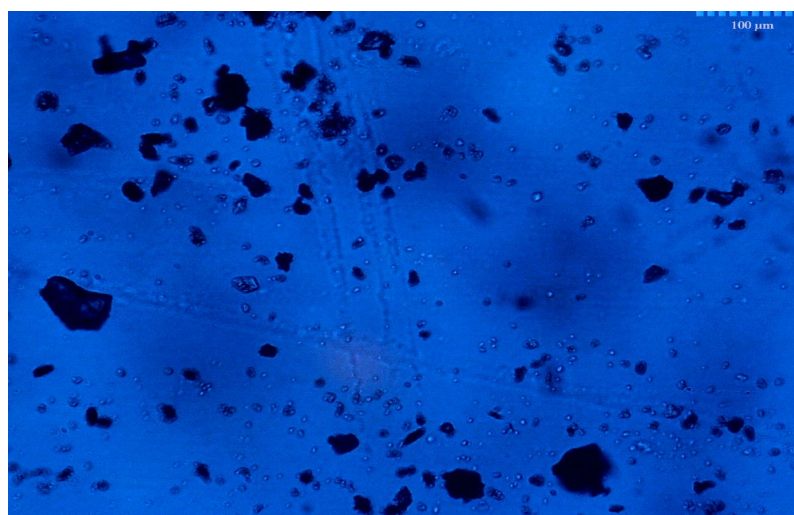
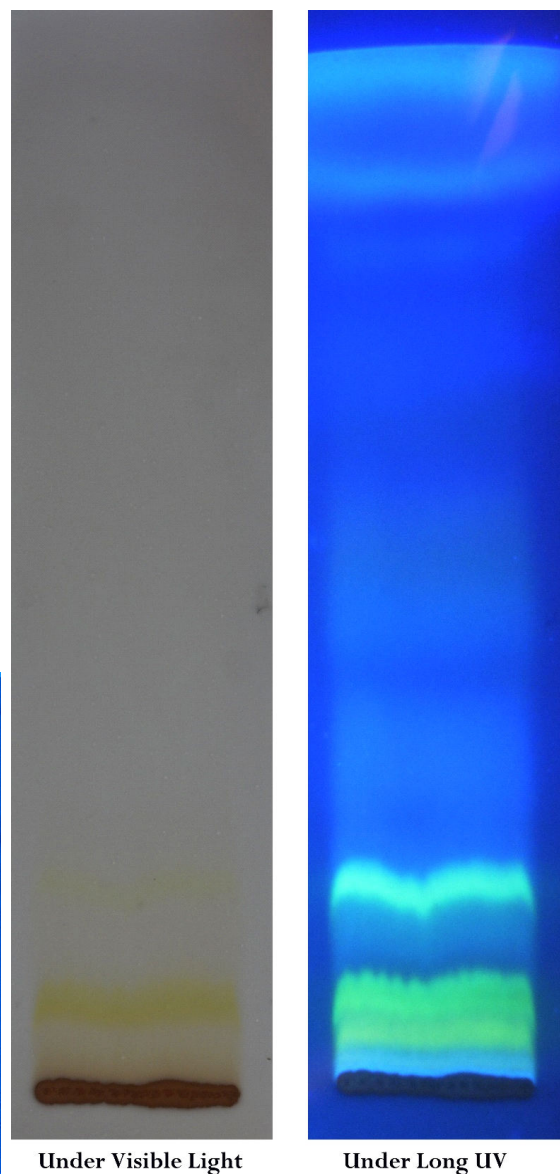


Photo Number: 3
Thin Layer Chromatography



4. Discussion and Conclusion

Preliminary phytochemical tests exhibited presence of carbohydrate, tannin, terpenoids, flavonoids, saponin and alkaloids. It was due to use of herbs and purification and due to presence of *Guggulu*. Different colours under visible light and under long UV in fluorescence tests is useful qualitative tests for formulation.

The quantitative estimation of elements was observed in percentage as 12.25, 6.25, 5.85, 4.42, 2.62, 2.12, 1.45, 1.15, 1.12 and 0.95 respectively for mercury, arsenic, iron, sulphur, aluminium, silica, potassium, calcium, magnesium and copper. The highest value of mercury is due to *Parada bhasma* and *Manashila*. Even iron is also found in *Loha bhasma* and *Abhraka bhasma*.

So, undertaken formulation for the study is combination of minerals and metals with plants. Number of further studies are required to find out the structural changes of minerals and metals with processing and their complex formation of organic compounds with herbal ingredients.

Conflict of Interest: No conflict of interest lies as per author.

Funding: Not funded

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