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PHYSICO-CHEMICAL ANALYSIS OF MANASHILA W.S.R. TO ITS VARIOUS SHODHANA PROCEDURES

Dr.Bandeppa Sangolgi[1], Dr.Ganapathi rao[2], Dr.Ganesh Charkha[3],
[1]Assistant Professor, [2,3]P.G.Scholar,P.G.Dept. of Rasashashtra & Bhashajya kalpana,
N.K.Jabshetty Ayurvedic Medical College & P.G. Center, Bidar

Abstract

Manashila is an important *Rasayana Dravya* and commonly used in treating the diseases like *Shwasa-Kasa, Agnimandya, Kshaya, Anaha, Jwara, Krimi, Visharoga*, *Raktavikara* etc. *Manashila* is called as red arsenic with two molecules of Arsenic and two molecules of Sulphur (AS_2S_2). *Manashila* consumed without proper *Shodhana* causes *Mandagni, Malabaddata, Ashmari* and *Mutra Krichra*. Hence *Shodhana* of *Manashila* is essential after which it cures all the diseases. *Shodhana* is the process of removal of physical, chemical impurities and potentiating of the drugs. The present study includes *Shodhana* of *Khandakhya Manashila* as per Classical reference of *Rasa Tarangini* where *Shodana* of *Khandakhya Manashiala* is done by *Churnodaka, Bhrungaraja Swarasa and Nimbuka Swarasa.* Standard Operative Procedure of the process is done in the pharmaceutical study. The analytical study reveals the standards which can be given for *Ashuddha Manashila* and *Shuddha Manashila* of various Samples. The differences in the parameters reveal that there are some changes which give us the idea regarding role of a particular media in purification of a substance, where it adds some properties of the media used.

Keywords : *Manashila*, *Shodhana*, *Rasayana*

INTRODUCTION

In the global scenario there is a lot of discussion regarding the toxicity of arsenic compounds. Arsenic compounds are being popularly used in *Ayurvedic* therapeutics since centuries. *Manashila* and *Haratala* being important among them[1]. *Manashila* is an important *Rasayana Dravya* and commonly used in treating the diseases like *Shwasa-Kasa, Agnimandya, Kshaya, Anaha, Jwara,*

Krimi, Visharoga, *Raktavikara* etc.[2,3] *Manashila* is called as red arsenic with two molecules of Arsenic and two molecules of Sulphur (AS_2S_2). *Manashila* consumed without proper *Shodhana* causes *Mandagni, Malabaddata, Ashmari* and *Mutra Krichra*[4]. Hence *Shodhana* of *Manashila* is essential after which it cures all the diseases[4]. *Shodhana* is the process of removal of physical, chemical impurities and potentiating of the drugs[5,6]. *Shuddha Manashila* is an important ingredient in most of the popular formulations like *Shwasakuthara Rasa, Rasa Raja Rasa, Trailokyachintamani Rasa* etc. There are various *Shodhana* procedures explained for *Manashila* in *Rasa* classics like *Rasa Ratna Samucchaya*[7], *Ayurveda Prakasha*[8] and *Rasa Tarangini*[9]. Some works on *Manashila* has been carried out like its clinical aspect on *Dhooma*, *Rasayana* and *Lepa*. In these various studies only one *Shodhana* procedure by *Ardraka Swarasa* is done[10] There are three types of *Manashila* like *Shyamangi, Kanaveeraka* and *Khandakya*[11], which are superior in increasing order. So *Khandakya* is superior most and which also yields more *Satva*[12]. For the present study *Khandakya* type of *Manashila* is selected. Various textual references of *Manashila*, will be collected from various classics and will be discussed. *Manashila* sample that has been selected for the present study will be qualitatively certified as per classical and modern analytical parameters. Various methods of *Shodhana* for *Manashila* explained in classics are collected and discussed.

Till today no work has been carried out on various *Shodhana* procedures of *Manashila*, intention behind these and complete structural validation of the same is yet to be established.

For the present study the various *Shodhana* procedures mentioned in *Rasa Tarangini*[9] are followed.

All the constituents used for *Shodhana* will be collected from local market area and our college Herbal garden. Good manufacturing practice will be followed for preparing the various medias and *Shodhana* of *Manashila* as per classical reference[9] mentioned below.

Sample	Raw Drug	Media	Process/Apparatus	Duration
1	*Manashila*	*Churnodaka*	*Nimmajana/Mrut Patra*	3 days
2	*Manashila*	*Bhrungaraja Swarasa*	*Swedana/Dola Yantra*	12 hours
3	*Manashila*	*Nimbu Swarasa*	*Bhavana/Khalwa Yantra*	7 times

Here scientific evaluation of various *Shodhana* procedures and Standard Operating Procedure (S.O.P) will be done by considering suitable physico-chemical parameters and possible instrumental methods which may add considerable input to the existing knowledge.

AIMS AND OBJECTIVES

1. Authentification of *Khandakya Manashila*.
2. Physico - chemical analysis of *Manashila*, before and after *Shodhana* procedures.
3. An attempt will be made to establish S. O. P for *Shodhana* procedures of *Manashila* by *Churnodaka, Bhrungaraja Swarasa* and *Nimbuka Swarasa*.

ANALYTICAL STUDY

Science means systematized and generalized knowledge of any thing, which can be proved by consecutive experimentation, with certain required standard parameters.

Science is challenged with the question 'WHAT' and 'HOW'. The discipline of analytical science dares to solve the mysteries. Though put to practice rather retrograde for the faculty of *Ayurveda*, the initiation of utilizing these modes of evaluation, after a particular stage of awareness regarding the existence of structures of the herbal, herbo-mineral or animal drugs, somewhat tallies with modern counterpart.

Data generated by the analytical study of any standard medicine suggest the quality, purity, safety of drug and specific therapeutic effects. If different physical and chemical components of medicine differ from the standard range of values, then therapeutic values of drug will not be the same as standard one. So, for quality control of drug analytical study gives us the valuable data. To make therapeutic effect of a drug predictable and reproducible,

which is the basic essence of quality control, analytical values must be the same as to standard.

The supply of essential drugs of good quality was identified as one of the prerequisites for the delivery of health care at the International Conference on Primary Health Care in Alma-Ata in 1978. Similarly, the Conference of Experts on the Rational Use of Drugs, held in Nairobi in 1985, and WHO's Revised Drug Strategy, adopted by the World Health Assembly in May 1986, identified the effective functioning of national drug regulation and control systems as the only means to assure safety and quality of medicines[50]

Analytical study of *Ayurvedic* drugs has become the need of present hour. In ancient days, the drugs were prepared by the physicians himself, with the help of experienced, assistants in their own pharmacies attached to their clinics. Now a days the trends have been entirely changed. The demand of *Ayurvedic* drugs have been increased by many folds and availability of raw materials are limited. So, there are of chances of production of low quality drugs for the commercial benefits.

The increasing demand for *Ayurvedic* drugs have made it necessary that some sort of uniformity in the manufacturing of *Ayurvedic* medicine should be brought out. The need has also been felt for statutory control to ensure standards of *Ayurvedic* drugs.

The quality of final products depends on the raw material used, intermediate process as well as on the pharmaceutical procedure adopted. Intermediate process also include the *Shodhana* procedure, where in different *Shodhana* media have different property which may result in mode of absorption, assimilation and action of the main drug. Various methods have also been prescribed for *Shodhana* of different drugs.

Chemical analysis of any drug should be known well before experimental and clinical trials. Chemical study ensures not only chemical constituents but also suggests us standards of any preparation. It not only gives standards of the products but

indirectly gives suggestions for further advancement if required.

To evaluate the quality of finished products, it becomes necessary to subject the drugs for various analytical studies. The drugs should be understood and interpreted in the light of advanced chemistry to provide scientific background. For *Manashila*, which is an important drug of *Ayurveda, Shodhana* has been prescribed in various media and different methods are also available. For the present study, *Shodhana* of *Manashila* as per Classical reference of *Rasa Taranginі*[9]. was followed for preparing the various medias and *Shodana* of *Manashila* mentioned below

Table No.-5.1 Showing media, process, apparatus and duration

Sample	Raw Drug	Media	Process/Apparatus	Duration
1	*Manashila*	*Churnodaka*	*Nimmajana/Mrut Patra*	3 days
2	*Manashila*	*Bhrungaraja Swarasa*	*Swedana/Dola Yantra*	12 hours
3	*Manashila*	*Nimbu Swarasa*	*Bhavana/Khalwa Yantra*	7 times

Analysis were carried out at Central Laboratory, Bhagavathi Ana Labs Pvt. Ltd., Industrial Estate, Sanathnagar, Hyderabad.The analytical study was undertaken with an aim to suggest suitable parameters and their expected values for routine quality control of the below samples

Sample 1. *Raw Khandakya Manashila*

Sample 2. *Shuddha Manashila* (By *Churnodaka*)

Sample 3. *Shuddha Manashila* (By *Bhrungaraja Swarasa*)

Sample 4. *Shuddha Manashila* (By *Nimbu Swarasa*)

Analytical Parameters:

The 4 samples were analyzed by using the following parameters:

I. Organoleptic characters:

- Colour - *Rupa*
- Odour - *Gandha*
- Consistency - *Sparsha*
- Taste - *Rasa*

II. Physico-chemical parameters:

- Determination of Foreign Matter of *Ashuddha Manashila*
- Loss on drying at 110^0 c

- Ash Value (Water insoluble)
- Ash Value (Acid insoluble)
- Water Soluble Extractive
- Alcohol Soluble Extractive
- Determination of Sulfur as S

III. Inductively coupled Plasma – Mass spectroscopy (ICPMS)

IV. Phase identification by diffract gram using x ray diffraction method

I. Organoleptic parameters:

The *Sparsha* (Consistency), *Rupa* (Colour), *Rasa* (Taste) and *Gandha* (Odour) of all the 4 samples were noted. These characters correspond to the *Panchagyanedriya Pariksha* of *Ayurveda*. These various organoleptic characters provides an idea regarding the genuinely of the sample both to the physician and patient. These give a primary idea about the quality of different formulations without using any chemical tests.

II. Physico-chemical parameters

1) Determination of foreign matter[11]:

Raw drugs should be free from moulds, insects, animal fecal matter and other contaminations such as earthen, stones and extraneous material. Any matter not covered by the description of the drug in the monograph shall be regarded as a non- extraneous foreign matter.

Foreign matter is material consisting of any or all of the following:

(i) In particular, parts of the organ or organs from which the drug is derived other than the parts named in the definition or for which a limit is prescribed in the individual monograph.

(ii) Any organ or part of organ, other than those named in the definition and description.

It was determined by taking the 100 gm weighed quantity of Sample 1 i.e *Ashuddha Khandakya Manashila* and was spread in a thin layer. Foreign matter or foreign organs was separated out and weighed and percentage was calculated out.

2) Loss on drying at 110^0 C.[12]:

This test was conducted to find out the moisture content in the samples. About 1g, accurately weighed samples 1,2,3,4 were taken in a previously dried and weighed dish and heated in a hot air oven at 110°C till constant weight. It was cooled and the weight was noted. Difference between the weights was calculated and taken as the loss on drying. The loss on drying

of the sample was expressed as % w/w.

Determination of Total Ash[13]

Incinerate about 2 to 3 g accurately weighed, of the ground drug in a tared platinum or silica dish at a temperature not exceeding 450º until free from carbon, cool and weigh. If a carbon free ash cannot be obtained in this way, exhaust the charred mass with hot water, collect the residue on an ash less filter paper, incinerate the residue and filter paper, add the filtrate, evaporate to dryness, and ignite at a temperature not exceeding 450º. Calculate the percentage of ash with reference to the air-dried drug.

3) Determination of Acid Insoluble Ash[14]:

Boil the ash obtained in (2.2.3) for 5 minutes with 25 ml of *dilute hydrochloric acid;* collect the insoluble matter in a Gooch crucible or on an ash less filter paper, wash with hot water and ignite to constant weight. Calculate the percentage of acid-insoluble ash with reference to the air dried drug.

4) Determination of Water Soluble Ash[15]:

Boil the ash for 5 minutes with 25 ml of water; collect insoluble matter in a Gooch crucible, or on an ash less filter paper, wash with hot water, and ignite for 15 minutes at a temperature not exceeding 450º. Subtract the weight of the insoluble matter from the weight of the ash; the difference in weight represents the water-soluble ash. Calculate the percentage of water-soluble ash with reference to the air-dried drug.

5) Determination of Water soluble extractive[16]:

This test was carried out to evaluate the water-soluble principles of the samples. 5g of sample was weighed accurately, 100 ml of distilled water was added to it and it was kept overnight. Next day, it was filtered. 20 ml of the filtrate was transferred to a dried and weighed evaporating dish. The solvent was evaporated on a water bath, dried till constant weight, cooled and weighed immediately. From the weight of the residue, the percentage of water-soluble extractive was calculated and expressed as %w/w.

6) Determination of Alcohol Soluble Extractive[17]:

Macerate 5 g of the air dried drug, coarsely powdered, with 100 ml of Alcohol of the specified strength in a closed flask for twenty-four hours, shaking frequently during six hours and allowing it to stand for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml of the filtrate to dryness in a tarred flat bottomed shallow dish, and dry at 105º, to constant weight and weigh. Calculate the percentage of alcohol-soluble extractive with reference to the air-dried drug.

7) Determination of Sulfur as S[18]:

Extract a suitable quantity of the sample with carbon disulphide. Filter the carbon disulphide solution and evaporate off the solvent. To the residue add 10ml of 10% alcoholic potash and boil until the sulfur has dissolved. Dilute with water, oxidize by adding hydrogen peroxide solution in excess and heat on a water bath for ½ hour. Acidify with hydrochloric acid, filter and to the filtrate add barium chloride solution. White precipitate of $BaSO_4$ shows the presence of sulfur.

III. Inductively coupled Plasma – Mass spectroscopy (ICPMS) [19]:

Among the various digestion procedures microwave digestion in the most modem reliable, sensitive method as it retains all the volatile metal ions and can be done with a small volume of sample.

In the present investigation, Microwave closed digestion technique has been adopted as it is not only rapid procedure for digestion of samples but protects all volatile metal ions (Pb, Cd, Mg, As, Se…….)

Materials required:

Reagents :

1. Sub-boiled Nitric acid
2. De ionised water (Milli-Q)
3. Rhodium (2 ppm) – Internal standard (Purchased from High purity standards, cat no – 100044-2).
4. Multi-Element reference standard. Supplied by National institute of Standard Technology (NIST – Standard Reference material – 3171a and 3172b).

i. NIST – A

ii. NIST – B

Certified concentrations of constituent elements.

Elements	Source, Purity %	Concentration, ug/ml
Aluminum	Metal, (99.99)	100.1 +/- 0.5
Antimony	Metal, (99.99)	100.0 +/- 0.5
Beryllium	Metal, (99.99)	10.0 + /- 0.1
Cadmium	Metal, (99.99 +)	100.3 + /- 0.5
Chromium	Metal, (99.96 +)	100.0 + /- 0.5
Iron	Metal, (99.96)	100.1 + /-0.5
Magnesium	Metal, (99.98)	100.0 + /- 0.5
Manganese	Metal, (99.76)	99.8 +/-0.5
Molybdenum	Metal, (99.96)	100.0 + /- 0.5
Nickel	Metal, (99.99)	100.1 +/- 0.5
Potassium	Kcl, (99.98)	499.8 + /-2.5
Sodium	Nacl, (99.9)	100.0+ /- 0.5
Vanadium	Metal, (99.97)	100.0 +/- 0.5

Equipment :

1. **Microwave oven (Domestic):** The microwave oven is placed in fume hood having exhaust facility to fulfill the safety criteria.

   Microwave oven details :

   Bajaj Microwave oven – Frequency – 2450 MHZ;Power input – Voltage – 220-240 Volts,Current – 8 Amp (Max) Frequency – 50 Hz,Type – Single phase 3 wire grounded,Power output – Variable level – 10 levels (1 to H) 140-700 watts
2. **Parr microwave Acid digestion Vessel -**(Model 4782 with PTFE cup, cover and O-ring) preferably 45 ml capacity which is obtained from parr instrument company, USA is used.
3. **ICPMS–Model–** VG elemental Plasma Quad 3-A complete profile of the required elements is obtained after calibrating the equipment

Procedure :

1. The preserved samples at – 80^{o} C have been taken out from deep freezer and kept at room temperature for 1hr before digesting the samples.
2. 300 ul of sample is mixed with 2ml of sub boiled nitric acid for digestion in Teflon lined Parr bomb which are cleaned thoroughly by Nitric acid.
3. The sample containing Parr bombs are subjected to closed microwave digestive system at medium power (level 5) for 3 minutes.
4. The par bomb is removed from microwave and allowed to cool for 45-

60 minutes to release the pressure built up.

5. The clear digested sample is carefully transferred to Nitric acid cleaned Poly propylene tubes / Standard volumetric flasks and diluted to 10ml with Demonized water ICP-MS analysis.
6. 20 ppb of Rhodium, NIST – A and NIST – B is added to the digested sample before subjecting to ICPMS analysis.
7. The above prepared sample (50 ul) is passed in to ICPMS after calibrating the equipment. (Figure-15)

Calculations:

The values in ppb levels i.e. ng/ml obtained are converted into µg/dl by applying the dilution factor.

Element concentration = Value obtained in ppb (A) X Dilution factor (B) (ppb (ng/ml) Amount of sample taken (C)

Sr. No.	Elements	Sensitivity (ppb-ng/ml)	Normal values (µg/dl)
1	Lead	Ppt to sub part per billion	> 20
2	Cadmium	Ppt to sub part per billion	0.3-7.0
3	Arsenic*	Ppt to sub part per billion	2-23
4	Mercury*	Ppt to sub part per billion	0.6-5.9

IV. Phase identification by diffract gram using x ray diffraction method[20]

It is categorized as a special and sophisticated technique, conducting the analysis in a non-destructive fashion. A variety of X-Ray techniques and methods are in use. The main three categories in which all the methods are classified are.

i. X-Ray Absorption Methods
ii. X-Ray Fluorescence Methods
iii. X-Ray Diffraction Methods

As we have adopted the X-Ray Diffraction method, we will go into the essential details of this method only.

PRINCIPLE:-X-RAY DIFFREACTION METHODS

When a beam of X-Radiation is incident upon a substance, the electrons constituting the atoms of the substances become as small oscillators. These oscillate at the same frequency as that of incident X-radiation. These scattered waves come from electrons which are arranged in a regular manner in a crystal lattice and then travel in certain directions. If these waves undergo constructive interference they are said to be diffracted by the crystal place. Every crystalline substance scatters the X-

rays in its own unique diffraction pattern producing a finger print of its atomic and molecular structure. The following methods are used in the X-Ray diffraction Technique.

i. Laue Photographic Method
ii. Bragg X-ray Spectrometer Method
iii. Rotating Crystal Method
iv. Powder Method

We have adopted the Bragg X-Ray spectrometer method. When X-rays fall on a sample, they get diffracted as per the Bragg's equation :-

Nλ = 2d sin θ (depending upon arrangement of atoms)

Where, λ = Wavelength of X-rays

θ = Spacing between the layers of atoms, d = Angle of incident X-rays

Materials and Methods :-

X-ray Diffraction (XRD) patterns were obtained using a Shimadzu XRD-6000 diffractometer with Cu-Kα as target with 40 KV voltages and 30 MA current.

Sample Preparation:

The powdered sample was placed in a sample holder and analysis was carried out in a static position with the detector moving through 2 θ 3 to 70.

Characterization :

The X-ray diffraction of the sample is matched against the standard reference spectra library of software for phase identification. The method gives certain emission peaks which are characteristic of elements contained in the target. The wavelengths of the peaks can be related to the atomic number of the elements producing them, so they provide a means of identifying elements present in the target sample. Furthermore, under controlled conditions, the intensity of the peaks can be used to determine the amounts of the various elements present. This is the basis of "electron probe microanalysis", in which a small target area of the sample in pinpointed for examination. This has important applications in metallurgical research and in determining the metallic elements in biological materials (if present).(Fig-16)

Observations and Results

Table no. 5.2- Showing Organoleptic Parameters of all Samples

Manashila	Colour	Odour	Consistency	Taste
Sample 1	Reddish with brown tinge and shiny	Peculiar	Crystalline, Smooth	*Katu, Tikta*
Sample 2	Reddish brown with little shiny	Peculiar	Crystalline, Smooth	*Katu, Tikta*
Sample 3	Bright reddish shiny	Peculiar	Crystalline, Smooth	*Katu, Tikta*
Sample 4	Yellowish orange non shiny	Peculiar	Flakes	*Katu, Tikta*

Above **Table no 5.2** reveals that **Sample 1** i.e. *Ashuddha Manashila* is having reddish with brown tinge and shiny, peculiar odor with crystalline smooth surface. **Sample 2** i.e. *Shuddha Manashila (Churnodaka Shodita)* was reddish brown with little shiny, peculiar odor, crystalline smooth. **Sample 3** i.e *Shuddha Manashila (Bhringaraja Swarasa Shodhita)* was bright reddish shiny color, peculiar odor, and crystalline smooth texture. **Sample 4** i.e *Shuddha Manashila (Nimbuka Swarasa Shodhita)* was yellowish orange non shiny, peculiar odor and flakes, which were later converted into powder. The first three samples were having *Katu Tikta Rasa* and fourth sample is having *Katu, Tikta, Amla Rasa*

Table no. 5.3- Showing Physico-chemical Parameters of all Samples

Parameters	Sample 1	Sample 2	Sample 3	Sample 4
Determination of Foreign Matter % w/w	2%	----	----	-----
L.O.D at 110^0 C w/w	0.2	0.3	0.7	1.8
Water Soluble Ash % w/v	4.0	3.9	4.2	3.8
Acid Insoluble Ash % w/v	1.4	1.2	1.8	1.8
Water Soluble Extractive % w/v	0.4	0.4	0.5	11.1
Alcohol Soluble Extractive % w/v	1.1	1.0	0.8	8.7
Determination Of Sulfur as S % w/w	26.35	25.53	26.88	22.54
Arsenic as As (ICPMS) mg/kg (ppm)	8.55	8.87	7.88	8.98

(Appendices)

Table no. 5.3 reveals that in *Ashuddha Khandakya Manashila* there is 2% of foreign matter, which reveals the adulteration, is not more. Loss on drying was found less in sample 1 and more in sample 4. Water soluble ash

was found less in sample 4 and more in sample 3. Acid insoluble ash was found less in sample 2 and more in sample 3 and 4. Water soluble extractive was found less in sample 1 and most in sample 4. Alcohol soluble extractive was found less in sample 3 and more in sample 4. Determination of Sulfur reveals that it is less in sample 4 and more in sample 3. Arsenic as As is less in sample 3 and more in sample 4.

IV. Phase identification by diffract gram using x ray diffraction method[20]

Table No.5.4- Showing x ray diffraction

Sample*	As 3d (FWHM) ev	S 2d (FWHM) ev	As:S Atomic %	Auger Parameter
Sample – 1 As 2S 2	33.4 (1.7)	162.5 (2.2)	40:60	1266.1
Sample – 2	33.0 (1.85) Trace Oxide at surface (19 at%)	162.0 (2.3)	40:60	1266.2
Sample – 3	33.0 (1.76)	162.7 (2.7)	32:68	1265.8
Sample – 4	33.1 (1.8)	162.4 (2.3)	37:63	1266.2

1. From Auger parameter (AP) values it appears that the samples are As2S2. AP values for AS-O are much lower than that for sulphide. For example AP:As203 = 1263.3 and AP: As205 = 1263.6. We tried to get at% of As and S on the surface. However XRD can get the exact phase.

2. Trace of oxide is found in sample 2 and sample 4. The amount of oxide (As-O) is shown in the table. Its small, but its presence is very much seen in the spectra.

3. Sample 3 was sputtered for 30 min (removing app 60 A) and the oxide was removed. The stoichiometric ration of As and S was seen. So the oxide may be residing only on the sample surface.

4. The change of color of the sample might have caused by the S on the surface. We found that the S amount varies in different samples as shown in table.

DISCUSSION

The present research work was planned with an aim to establish Standard Operating Procedure (S.O.P) for *Shodhana* procedures of *Ashuddha Khandakhya Manashila* by *Churnodaka, Bhringaraja Swarasa and Nimbuka Swarasa*. To find out the

effect of different S*hodhana* medias on the physico-chemical properties of *Manashila*. Went through the whole literature on *Manashila* available from *Vedic* period to the advancement of present time. To achieve the goal of present study, the work has been divided in three major parts – Conceptual study which includes Drug review and Concept of *Shodhana,* Pharmaceutical study, Analytical study. Analysis and results of each study are discussed in this section.

Analytical study of *Ayurvedic* drugs has become the need of present hour. In ancient days, the drugs were prepared by the physicians himself, with the help of experienced, assistants in their own pharmacies attached to their clinics. Now a days the trends have been entirely changed. The demand of *Ayurvedic* drugs have been increased by many folds and availability of raw materials are limited. So, there are of chances of production of low quality drugs for the commercial benefits.

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Sample 2. *Shuddha Manashila* (By *Churnodaka*)

Sample 3. *Shuddha Manashila* (By *Bhrungaraja Swarasa*)

Sample 4. *Shuddha Manashila* (By *Nimbu Swarasa*)

Analytical Parameters:

The 4 samples were analyzed by using the following parameters:

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- Odour - *Gandha*
- Consistency - *Sparsha*
- Taste - *Rasa*

II. Physico-chemical parameters:

- Determination of Foreign Matter of *Ashuddha Manashila*
- Loss on drying at 110^0 c
- Ash Value (Water insoluble)
- Ash Value (Acid insoluble)
- Water Soluble Extractive
- Alcohol Soluble Extractive
- Determination of Sulfur as S

III. Inductively coupled Plasma – Mass spectroscopy (ICPMS)

Table no 5.2 reveals that **Sample 1** i.e. *Ashuddha Manashila* is having reddish with brown tinge and shiny, peculiar odor with crystalline smooth surface. **Sample 2** i.e. *Shuddha Manashila (Churnodaka Shodita)* was reddish brown with little shiny, peculiar odor, crystalline smooth texture. **Sample 3** i.e *Shuddha Manashila (Bhringaraja Swarasa*

Shodhita) was bright reddish shiny color, peculiar odor, and crystalline smooth texture. **Sample 4** i.e *Shuddha Manashila (Nimbuka Swarasa Shodhita)* was yellowish orange non shiny, peculiar odor and flakes, which were later converted into powder. The first three samples were having *Katu Tikta Rasa* and fourth sample is having *Katu, Tikta, Amla Rasa*

Table no. 5.3 reveals that in *Ashuddha Khandakya Manashila* there is 2% of foreign matter, which reveals the adulteration, is not more. Loss on drying was found less in *Ashuddha Manashila* and more in *Shuddha Manashila (Nimbuka Swarasa Shodhita)*. Water soluble ash was found less in *Shuddha Manashila (Nimbuka Swarasa Shodhita)* and more in *Shuddha Manashila (Bhringaraja Swarasa Shodhita)*. Acid insoluble ash was found less in *Shuddha Manashila (Churnodaka Shodita)* and more in *Shuddha Manashila (Bhringaraja Swarasa Shodhita)* and *Shuddha Manashila (Nimbuka Swarasa Shodhita)* . Water soluble extractive was found less in *Ashuddha Manashila* and most in *Shuddha Manashila (Nimbuka Swarasa Shodhita)*. Alcohol soluble extractive was found less in *Shuddha Manashila (Bhringaraja Swarasa Shodhita)* and more in *Shuddha Manashila (Nimbuka Swarasa Shodhita)*. Determination of Sulfur reveals that it is less in *Shuddha Manashila (Nimbuka Swarasa Shodhita)* and more in *Shuddha Manashila (Bhringaraja Swarasa Shodhita)*. Arsenic as As is less in *Shuddha Manashila (Bhringaraja Swarasa Shodhita)* and more in *Shuddha Manashila (Nimbuka Swarasa Shodhita)*.

By performing *Shodhana* procedure, moisture content was increased. Ash value was reduced, water soluble ash was reduced. Acid insoluble ash was increased. Water soluble extractive was increased compared to *Ashuddha Manashila* and was maximum in *Shuddha Manashila (Nimbuka Swarasa Shodhita)*. Alcohol soluble extractive was also increased compared to *Ashuddha Manashila* and was maximum in *Shuddha Manashila (Nimbuka Swarasa Shodhita)*. Sulfur as S was equal in most of the samples but was reduced in *Shuddha Manashila (Nimbuka Swarasa Shodhita)*. Arsenic

as As was equal and slight decrease was found.

IV. Phase identification by diffract gram using x ray diffraction method[19]

From Auger parameter (AP) values it appears that the samples are As2S2. AP values for AS-O are much lower than that for sulphide. For example AP:As203 = 1263.3 and AP: As205 = 1263.6. We tried to get at% of As and S on the surface. However XRD can get the exact phase. Trace of oxide is found in sample 2 and sample 4.

The amount of oxide (As-O) is shown in the table 5.3. Its small, but its presence is very much seen in the spectra. Sample 3 was sputtered for 30 min (removing app 60 A) and the oxide was removed. The stoichiometric ration of As and S was seen. So the oxide may be residing only on the sample surface.The change of color of the sample might have caused by the S on the surface. We found that the S amount varies in different samples as shown in table 5.3..

This shows the role of different media in deciding the absorption, assimilation, effect and excretion of the drug. So due to these there may be changes in mode of action and also disease and disease condition.

CONCLUSION:

- *Manashila* is used both internally and externally.
- Out of three types of *Manashila, Khandakhya Manashila* is therapeutically used in most of the *Rasa Granthas (Uttarottara Sreshta)* and yields more *Satwa.*
- *Shuddha Manashila* is not used alone. It is administered along with herbal drugs or is an important ingredient in popular formulations like *Shwaskuthara Rasa, Kalanala Rasa, Trilokyachintamani Rasa, Kshayakesari Rasa, Manashiladhi Ghrita* etc.
- *Ashuddha Khandakhya Manashila* is reddish, brownish black tinge with shining crystalline smooth texture and having peculiar odor.
- *Shuddha Manashila (Churnodaka Shodita)* was reddish brown with little shiny, peculiar odor, crystalline smooth texture.
- *Shuddha Manashila (Bhringaraja Swarasa Shodhita)* was bright reddish shiny color, peculiar odor, and crystalline smooth texture

- *Shuddha Manashila (Nimbuka Swarasa Shodhita)* was yellowish orange non shiny, peculiar odor, smooth and flakes, which were later converted into smooth powder
- The first three samples were having *Katu Tikta Rasa* and fourth sample is having *Katu, Tikta, Amla Rasa*
- All relevant analytical data of samples of *Ashuddha* and *Shuddha Manashila* are showing difference in their physical and chemical values. It shows the importance of process of *Shodhana*, which is probably responsible for safe therapeutic uses of *Manashila.*
- This shows the role of different media in deciding the absorption, assimilation, effect and excretion of the drug. So due to these there may be changes in mode of action and also disease and disease condition.
- The properties of liquid media embedded into the *Manashila* during the process of *Shodhana* may augment the effect of *Manashila*.
- To prove these concepts further studies can be conducted by experimental and clinical study.

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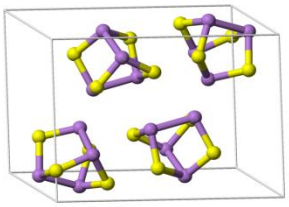
Photographs

Figure-1

Ashudda Manashila (Khandakya)

Figure-2



Atomic Structure of

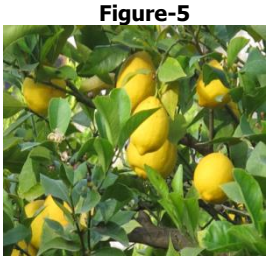
Figure-3

Churna

Figure-4

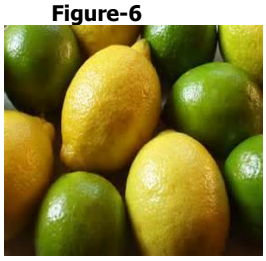
Bhringaraj

Figure-5



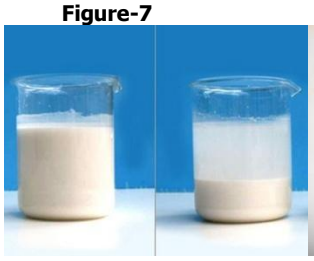
Nimbuka Plant

Figure-6



Nimbuka

Figure-7



Churnodaka

Figure-8

Shuddha Manashila

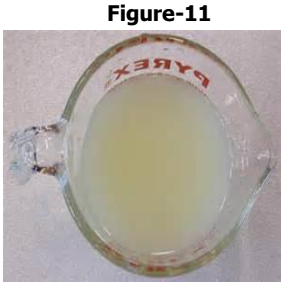
Figure-9

Bhrungaraja Swarasa

Figure-10

Shuddha Manashila

Figure-11

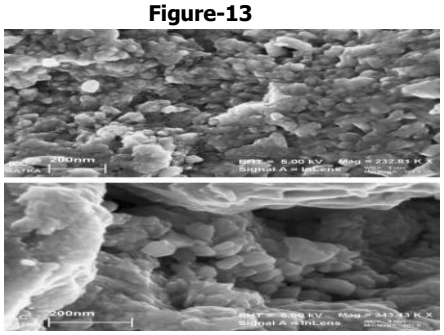


Nimuka Swarasa

Figure-12

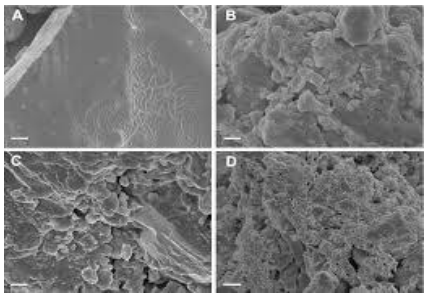
Shuddha Manashila

Figure-13



SEM EDX of Realgar

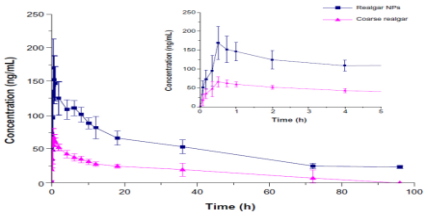
Figure-14



SEM EDX of Realgar

Figure-15

Figure-16



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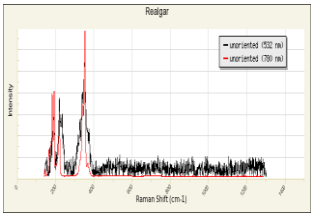

X Ray diffraction of Realgar

Corresponding Author

Dr.Bandeppa Sangolge,
Associate Professor,
Post Graduate Department of R.S & B.K,
N.K.Jabshetty Ayurvedic Medical
Collage,Bidar-585403(Karnataka)
Email: bvsangolge123@gmail.com

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