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PHARMACEUTICAL AND PHYSICO-CHEMICAL ANALYSIS OF THREE DIFFERENT SAMPLES OF SHODHITA MANASHILA

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ABSTRACT

Manashila is one of the mineral drugs that has history of usage since vedic period. All rasa and purana granthas explain its external and internal usage. Manashila after shodhana, mainly cures diseases like krimi, kushta, kasa, swasa etc and has got wide range of disease curing capacity which is a positive thing for us in today's era. Manashila is purified by various methods with different herbal juices which is explained in different classics. Here the purification method followed is bhavana with different herbal juices as per Rasa tarangini. Three different swarasa ardraka, bijapura, agashhyapatra had taken for bhavana. Seven bhavana given to manashila with each swarasa. Finaly three different samples of shodhita manashila were prepared. All the observation during shodhana procedure was noted and documented. Raw manashila and three samples of shodhita manashila subjected to analytical study like specific gravity, moisture content, solubility, PH. Physico chemical analysis of Raw and three samples of shuddha manashila contributes to set standards for standardization. In shodhita manashila percentage of As increased & S decreased. 80 % reduction in particle size (0.71 microns), pH 12.5, Moisture 1-3%, Sp. Gravity 1.003 noted. Triclinic & monoclinic crystal structure with variations in dimensions. As, S and other trace elements noted. Particle size reduced, crystal structure altered.

KEYWORDS: Manashila, PH, Shodhana, Bhavana, Swarasa.

INTRODUCTION

Manashila is one of the mineral drugs that have history of usage as old as vedic period. In Rigveda its usage has been mentioned for environmental purification. Whereas in Atharvaveda and purana granthas it's external and internal usage is mentioned.[1] It is also used in Rasa karma and Dhatu ranjana.[2] Chanakya has mentioned in his ArthaShastra, its use in warfare as lepadhis. Manashila after shodhana, mainly cures diseases like krimi, kushta, kasa, swasa etc and has got wide range of disease curing capacity.[3] Manashila is purified by various methods and with different herbal juices which is explained in different classics. Here the purification method followed is bhavana with different herbal juices according to Rasa tarangini.[4] three different swarasa ardraka,[5] bijapura,[6] agashhyapatra[7] had taken for bhavana procedure according to the classics. Seven bhavana given to manashila with ardrka swarasa. same procedure carried out by bijapura swarasa and agasthya pathra swarasa. finaly three different samples of shodhita manashila were prepared .all the observation during shodhana procedure was noted and documented Physico chemical analysis of Raw and three samples of shuddha manashila contributes to set standards for standardization. Different properties of suddha manashila needs scientific explanation and validation. With the advent of new drug delivery systems, advancement in drug technology sciences, strict FDA guidelines for drug approval, growing health awareness in mass, it is desirable to study the principles and practice of Ayurveda by utilizing the facilities of modern methods.

MATERIALS AND METHODS

1. Materials

A. Drugs

1. Raw manashila
2. Agasthya patra
3. Ardraka
4. Bijapura

B. Equipment

1. Khalva yantra
2. Electric burner
3. Silica crucible
4. Digital pH meter
5. Hot air oven

6. Whatman paper No.40

C. Glass wares

1. Test tubes
2. Beakers
3. Funnel
4. Petri dish
5. Specific gravity bottle – Pycnometer

D. Chemicals and solvents

Distilled water	Benzene
Ethanol	Toluene
Methanol	H2 SO_4.(conc)
Carbon tetra chloride	Glacial acetic acid
Ether	10% NaOH
Xylene	10% KOH
Chloroform	6 NHCl
Acetone	

Method: Physico – Chemical analysis/evaluation.

PHARMACEUTICAL STUDY

Manashila, one among the uparasa, is purified by various methods and with different herbal juices which is explained in different classics. Here the purification method followed is bhavana with different herbal juices according to Rasa tarangini.

During the preparation each step was noted and documented.

Study design

Step 1: Identification and selection of raw material.

Step 2: Shodhana by the process called bhavana.

METHOD

Step 1: Identification and selection of raw material.

Manashila: brittle in nature, deep red in colour and heavy(khandhakya) as per Rasa ratna samuchaya.

Step 2: Shodhana of Manashila

Three different swarasas were taken as bhavana dravya for shodhana. The pharmaceutical preparations done were as follows,

1. Manashila shodhana by 7 bhavanas with Bijapura rasa
2. Manashila shodhana by 7 bhavanas with Agastya swarasa
3. Manashila shodhana by 7 bhavanas with Ardraka rasa

Practical-1: Shodhana of Manashila with Ardraka swarasa bhavana

Reference: Rasa Tarangini 11:114

Preparation of Ardraka swarasa:

Principle: Pounding

Ingredients: Ardraka

Equipment: Ulukhala yantra (manual pounding machine), cotton cloth, measuring glass.

Procedure: Properly cleaned Ardraka was cut into pieces and pounded well, squeezed through cloth and swarasa filtered.

Observation: Dull yellowish green colour swarasa obtained Shodhana of Manashila:

Principle: Bhavana- 7 times.

Ingredients: Raw manashila- 500 gms, Ardraka swarasa q.s. Equipments: Khalwa yantra.

Procedure: Raw Manashila powdered and Ardraka swarasa was added till samyak plutha. After that mardana done till it gets dried, which completes one bhavana. This process is done for 7 times.

Practical 2: Shodhana of manashila with bijapura swarasa bhavana

Reference: Rasa Tarangini 11:115.

Preparation of Bijapura swarasa.

Principle: squeezing Ingredients: Bijapura

Equipment: Squeezer, filter, measuring glass.

Procedure

Properly cleaned bijapura was cut into two halves and squeezed.

Seeds are removed by filtering.

Observation: Very light yellow coloured juice obtained. Shodhana of manashila.

Principle: Bhavana- 7 times.

Ingredients: Raw manashila- 500 gms, Bijapura swarasa q.s.

Equipments: Khalwa yantra

Procedure: Raw manashila powdered, and sufficient quantity of Bijapura swarasa added till samyak plutha. Bhavana done till it gets dried. It completes one bhavana. This procedure is done for 7 times.

Practical 3: Preparation of Shodhita manashila- Agashtya patra swarasa bhavana.

Reference: Rasa Tarangini 11:113

Preparation of Agasthya patra swarasa

Principle: Squeezing

Ingredients: Agasthya patra.

Equipment: Khalwa yantra, cotton cloth, percolator, measuring glass.

Procedure: Fresh green leaves of Agasthyapathra is collected, properly cleaned and good leaves was selected. Made Kalka by pounding in khalwa yantra.4 Kalka is squeezed through white cotton cloth which is then filtered in percolator and swarasa is collected.

Observation

Dark green coloured juice obtained.

Shodhana of manashila.

Principle: Bhavana- 7 times

Ingredients: Raw manashila- 500 Gms, Agasthya patra swarasa q.s.

Equipments: Khalwa yantra

Procedure: Raw manashila powdered and sufficient quantity of Agasthya patra swarasa added till samyak plutha. Bhavana done till it gets dried. It completes one bhavana. This procedure is done for 7 times.

OBSERVATIONS AND RESULTS

I. Shodhitha Manashila (Ardraka swarasa bhavitha)

Observations:

1. After 7 bhavanas the colour changed from yellowish orange to brownish.
2. Odour of bhavana dravya along with the smell of manashila.
3. Increase in weight was noted.
4. Shiny particles completely disappeared. Results:

Table no 1: Shows the results of Ardraka swarasa bhavana of Manashila.

No. of bhavana	Qty of Manashila (gms)	Qty of swarasa (ml)	Time (hrs)	Qty. after bhavana (gms)	Remark (gms)
1	500	200	3.10	510	Gain-10
2	510	200	3.05	520	Gain-10
3	520	180	3.30	525	Gain-5
4	525	175	3.15	530	Gain-5
5	530	160	3.30	535	Gain-5
6	535	150	4.00	540	Gain-5
7	540	150	4.30	545	Gain-5

II) Shodhitha Manashila (Bijapura swarasa bhavitha)

Observations

1. After I bhavana, remarkable increase in weight was noted viz. from 500 to 530 gms.
2. Trituration was difficult after 5th bhavana due to excess sticky nature. so there was delay in drying and hence the period of bhavana was extended.
3. Even after 7th bhavana the drug was not dried and difficulty in powdering of the drug due to some moisture present in it.
4. Odour of bhavana dravya along with the smell of manashila
5. After 7 bhavanas the colour changed from yellowish orange to bright orange.
6. Shiny particles completely disappeared. Results:

Table no: 2 Shows the results of Bijapura swarasa bhavana of Manashila.

No.of bhavana	Qty.of Manashila	Qty. of swarasa (ml)	Time (hrs)	Qty. after bhavana (gms)	Remark (gms)
1	500	195	4.30	530	Gain- 30
2	530	190	5.50	535	Gain-5
3	535	185	5.05	540	Gain-5
4	540	175	4.30	550	Gain-10
5	550	170	5.00	560	Gain-10
6	560	180	6.15	565	Gain-5
7	565	190	7.30	570	Gain-5

III) Shodhitha Manashila (Agsathya patra swarasa bhavitha)

Observations

1. Dried powder was dark brown colour.
2. Remarkable constant increase in weight was noted.
3. Odour of bhavana dravya along with the smell of manashila.
4. Shiny particles completely disappeared. Results.

Table no: 3 Shows the results of Agasthyapatra swarasa bhavana of Manashila.

No. of bhavana	Qty of manashila (gms)	Qty of swarasa (ml)	Time (hrs)	Qty. after bhavana gms)	Remark (gms)
1	500	230	6.00	520	Gain-20
2	520	200	6.00	540	Gain-20
3	540	190	5.30	560	Gain-20
4	560	210	5.30	580	Gain-20
5	580	200	5.30	600	Gain-20
6	600	200	5.15	620	Gain-20
7	620	230	5.15	630	Gain-10

1. Organoleptic characters of Raw and Shodhita manashila(3 samples)

Table no.4 Shows Organoleptic characters of Raw and Shodhita manashila (3 samples).

Characters	Raw Manashila	SMBB	SMAgB	SMArB
Colour	Reddish orange	Orange	Dark brown	Light brown
Odour	Penetrating	Penetrating	Penetrating	Penetrating
Touch	Rough	Smooth	Fine	Fine
Taste	Pungent	Pungent	Pungent	Pungent
Appearance	Powder	Powder	Powder	Powder

2. Solubility test

Method

A pinch of sample was taken in a dry test tube and 1 ml of solvent is added to it and shaken for a minute. Then it is observed for a minute. Then it is observed for solubility, non solubility and sparingly solubility. The results are shown in the table no.9 for all the 4 samples.

3. Determination of specific gravity

Empty specific gravity bottle was weighed and the bottle filled with distilled water and again weighed. The same bottle was then filled with 1% of sample (100 ml of H_2O+ 1gm of sample) and weighed. All these three weights are noted. The specific gravity of sample was calculated according to the formula $\frac{W_3-W_1}{W_2-W_1}$

Where, W_1- weight of empty bottle W_2- weight of bottle filled c water

W_3 – weight of bottle filled with 1% sample solution.

Sample – A (SMBB)

W_1 = 24.650 gms. W_2 = 51.040 gms. W_3 = 51.230 gms.

Specific gravity $= \frac{W_3 - W_1}{W_2 - W_1} = \frac{51.230 - 24.650}{51.040 - 24.650}$

$= 1.007$

Specific gravity of shodhita Manashila (bijapura bhavitha) =1.007

Sample B: (SMAgB)

W1=24.650 gms

W2=51.040 gms

W3=51.180 gms

Specific gravity of S.M.Ag.Bha=1.005

Sample:C (Sho.M.Ar.B)

W1=24.650 gms

W2=51.040 gms

W3=51.230 gms

Sp.gravity of shodhita manashila (Ardraka Swarasa Bhavitha)=1.007

Sample D: (Raw Manashila)

W1=24.650 gms

W2= 51.040 gms

W3=51.110 gms

Specific gravity of raw Manashila =1.003

4. Determination of moisture content

Accurately weighed 1 gm of sample was taken in weighed Petri dish with a fitting cover (dried in 100º C before use) and kept in hot air over for one hour maintained at 105ºC. After one hour the Petri dish was taken and cooled in dessicator and weight noted. The procedure was repeated till successive weight does not differ.

Moisture content = (Weight of petridish + 1 gm sample – Constant weight of last reading) Then percentage of moisture content is calculated.

Sample A: (SMBB)

Moisture content = (85.140 + 1 – 86.120)

= 0.02

P**Sample B : (SMAgB)**

Moisture content = (84.450 + 1 – 85.425)

= 0.025

Percentage of moisture content = 0.025 x 100 = 2.5 %

Sample C: (SMArB)

Moisture content = (84.510 + 1 – 85.485)

= 0.025

Percentage of moisture content = 0.025 x 100 = 2.5 %

Sample D: (Raw)

Moisture content = (85.140 + 1 – 86.140)

= 0.00

Percentage of moisture content = 0.00 x 100 = 0 %

5. Determination of pH: pH meter was calibrated by using standard buffers of known pH 4.0, 7.2 and 9.2 at 30 C. The reference electrode was thoroughly washed with distilled water every time and wiped using filter paper. 1% of sample solution (1 gm sample + 100ml of D.W) was prepared. Then the tip of the electrode was dipped and recorded. Same procedure was reported for all 4 samples.

Sample A: (SMBB) - pH – 3.12

Sample B: (SMAgB) - pH – 3.15

Sample C: (SMArB) - pH – 4.12

Sample D: (R.M) - pH – 7.30

B) ELEMENTAL ANALYSIS, PARTICLE SIZE ASSESSMENT AND X-RAY DIFFRACTION ASSESSMENT

Method

1. Atomic Absorption Spectroscopy (Elemental Analysis)
2. Model 780 AccuSizer (Particle size Analysis)
3. X-Ray Diffraction (Structural analysis)

OBSERVATIONS AND RESULTS

Table no. 5: Shows Organoleptic characters of samples of raw manashila and shuddha manashila.

Characters	Raw Manashila	SMBB	SMAgB	SMArB
Colour	Reddish orange	Orange	Dark brown	Orange
Odour	Penetrating	Penetrating	Penetrating	Penetrating
Touch	Rough	Smooth	Fine	Fine
Taste	Pungent	Pungent	Pungent	Pungent
Appearance	Powder	Powder	Powder	Powder

SMBB- Shodhita manashila with Bijapura swarasa bhavana.

SMAgB- Shodhita manashila with Agasthya patra swarasa bhavana.

SMArB- Shodhita manashila with Ardraka swarasa bhavana.

Table no.6 Shows Solubility test of Samples Shuddha manashila.

Solvents	Raw	SMBB	SMAgB	SMArB
Distilled water	I.S	S.S	S.S	S.S
Chloroform	I.S	S.S	I.S	S.S
Xylene	I.S	S.S	I.S	I.S
Toluene	I.S	I.S	I.S	I.S
Methanol	I.S	S.S	I.S	S.S
Ethanol	I.S	S.S	I.S	S.S
CCl_4	I.S	S.S	S.S	S.S
Acetone	I.S	I.S	I.S	I.S
Benzene	I.S	I.S	I.S	I.S
Glacial Acetic acid	I.S	S.S	S.S	S.S
10% KOH	S.S	S.S	S.S	S.S
10% NaOH	S.S	S.S	S.S	S.S
6 NHCl	I.S	S.S	S.S	S.S
5% H2 So4	I.S	S.S	S.S	S.S

I.S- Insoluble **S.S.-** Sparingly soluble **S-** Soluble

SMBB- Shodhita manashila with Bijapura swarasa bhavana.

SMAgB- Shodhita manashila with Agasthya patra swarasa bhavana.

SMArB- Shodhita manashila with Ardraka swarasa bhavana.

Table no 7: Shows Physical Constants of Samples of raw and Shuddha manashila.

Physical Constants	SMBB	SMAgB	SMArB	Raw manashila
Moisture content	2%	2.5%	2.5%	0%
Specific gravity	1.007	1.005	1.007	1.003
PH	3.12	3.15	4.12	4.00

DISCUSSION

Raw Manashila was subjected for shodhana with three swarasas – bijapura, Agasthya and Ardraka as per the procedures mentioned in Rasa Tarangini. All the 3 samples of Shuddha and Raw manashila were subjected for Organoleptic, Physical and Chemical analysis. Manashila gained weight after each bhavana. After 7 bhavanas the weight of SMBB increased from 500 to 570 gms, SMArB increased from 500 to 545 gms and SMAgB from 500 to 630 gms. This increase in weight may be due to the addition of herbal juices in the processes. The solubility of raw and three samples of shuddha manashila were tested with several solvents. Raw drug was insoluble in almost all solvents and soluble only in 10% KOH and 10% NaoH. All the 3 samples of shuddha manashila were insoluble and sparingly soluble in most of the solvents. It was noted that the all the three samples were sparingly soluble in 10% KOH, 10% NaOH, distilled water and CCl_4. All the samples were sparingly soluble in alkaline solvents. This indicates that those are acidic in nature.

Shuddha manashila samples and raw manashila were subjected for pH analysis. pH varies from 3.12 to 7.3.

The moisture content of Raw drug was 0%. The moisture content of SMBB was 2%, SMAgB was 2.5% and SMArB was 2.5%. This increase in moisture content in comparison to raw drug may be because of addition of moisture and volatile organic matter from the herbal juices into the manashila d Difference in % of moisture and volatile organic matter may be due to different amount of organic matter associated with the bhavana dravya.

Specific gravity determined by using distilled water as solvent is almost equal to the specific gravity of H_2O (1.000). Specific gravity of raw manashila was 1.003, SMBB-1.007, SMAgB-1.005 and SMArB-1.007. This indicates that the specific gravity of all the samples were more or less equal to the water.

In Raw % of As was 52.400 and sulphur was 32.66 %; in SMBB it was 58.5333% and 23.30 %; in SMAgB 61.333% and 24.14% and in SMArB 62.6666% and 24.57%. The increase in % of As in all 3 samples of shuddha manashila may be due to the relative increase and decrease of weight of As, S and other minerals and metals after trituration with herbal juices. This results in decrease in the total mass of the As resulting in the increase of concentration (%) of As in the drug. The decrease in % of sulphur indicates that some % of sulphur has been lost from the samples because of heat produced due to friction during trituration with

herbal juices.

Fe, Pb, Si, K, Ca, Zn, Cu, Mn, Cr,Mg are the metals and minerals present in trace amounts both in raw as well as in shodhita samples. Some of these trace elements are also present in herbal juices which have attributed for the increase of some of the minerals after trituration. In all three samples, amount of Potassium is increased significantly may be due to attribution of high levels of potassium present in the herbal juices. This indicates that the qualities of bhavana dravya have attributed its properties to manashila.

Particle size analysis of raw manashila showed 0-20% of total no. of particles are having size less than 0.71 microns; 20 %-65% less than 1.73 microns; 65%-75% less than 3.87 microns; 75%- 95% less between the range of 5.92-17.32%; 95-99% less than 34.64 microns. This indicates that size of particles varies between 0 to 34.64 microns. Maximum uring trituration. particle size is 34.64 microns which indicates the heterogeneity of the distribution of the particles. In raw manashila maximum number of particles (65%) has size between 0.71-1.73 microns. Maximum number of particles (85%) has size between 0.71-1.73 microns in all three samples of shuddha manashila denoting that there is significant decrease in particle size when compared with raw manashila. Significant reduction in the particle size was noted after the bhavana processes.

XRD analysis of Raw manashila showed Monoclinic crystal structure with the cell volume as 801.378, vectors a-6.5988, b-13.5766, c-9.7747 and angles alpha-90.000, beta- 113.778, gamma-90.000. After shodhana the crystal structure of all three samples changed to Triclinic and Monoclinic. The monoclinic crystal structure found in shodhita samples having significant change in the cell volume, vectors and angles when compared to monoclinic structure of raw manashila. This indicates that some chemical changes would have taken place after trituration with specific herbal juices.

In Shuddha manashila with bijapura, agasthya and ardraka swarasa bhavana, significant reduction in particle size; attribution of qualities of bhavana dravya to manashila; Change in crystal structure from monoclinic of raw manashila to triclinic and monoclinic with alterations in cell dimensions implies that the textual quotation bhavanam gunantharaadhanam / gunavardhanam stands true.

CONCLUSION

Weight gain was noted in all three samples of shuddha manashila. Amorphous powder, light orange colour & odour of bhavana dravya observed in all three samples. All samples were sparingly soluble in 10% KOH and NaOH and insoluble or sparingly soluble in most of the solvents. Acidic pH was noted in all the 3 shodhita samples. Specific gravity more or less equal to water was noted in all the samples. Moisture content of raw manashila was 0, SMBB 2%, SMAgB 2.5%, SMArB 2.5%.80% reduction of particle size ranging between 0.71-1.73 microns were noted in all three shodhita samples compared to raw having 60 % .Percentage of As is increased in all three shodhita samples due to relative increase and decrease in the weight of As and other minerals. % of S decreased because of heat produced due to friction during trituration. Significant increase in % of K, Mg and Zn were noted in all three shodhita samples may be because of the same elements present in bhavana dravyas that would have attributed their properties to manashila. Monoclinic crystal structure of raw altered to triclinic & monoclinic structure in shuddha manashila with different cell dimensions. From the above observations and results, standards may be established for standardization of raw & shuddha manashila. These standards have given further scope for advanced study.

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