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Pharmaceutico - Analytical Study of Pittala Bhasma with Two Different Maarana Procedures - A Comparative Study

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ABSTRACT

In the developmental milestones of Rasashastra, use of metals in combined form plays a very significant role. Today modern pharmacologists and scientists are struggling very hard to find out new safe and efficacious drugs with the help of combinatorial chemistry and co-ordination chemistry. But ancient Rasa scholars have already developed and utilized such drugs clinically with wonderful results. One such novel combinatorial molecule is" Pittala"

Rasashastra has too many mineral and metallic drugs, among them Pittala is one such Mishra loha which is the combination of Tamra and Yashada in the ratio of 2:1, as it inherits property of both metals that makes it more efficacious in therapeutic action . Pittala Having tikta rasa, ruksha guna and lekhana property and it is considered as best Krimighna. Also indicated in Pandu, Kamala, Kushta Roga, and Vataroga.

Bhasmeekarana is that process by which inorganic substances like metals and minerals are converted into a safe non-toxic, biocompatible and non-elemental component. As Nano the particle size, better will be the absorption rate.

Maarana of Pittala with two different procedures is an attempt to focus on rationality behind exploring different procedures for maarana of Pittala.

KEYWORDS: *Pittala bhasma, Gajaputa, Shodhana, Maarana, Hingula, Haratala, Gandhaka, Manashila, Method 1(HHPB), Method 2(GMPB)*

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INTRODUCTION

Modern man is trying to decode all the natural secrets in the biosphere with the help of super technological advent. Still unexplored countless complex areas exist in the universe. One such area is Rasashastra.

Pittala (Brass) is a combined form of Copper and Zinc in 2:1 ratio is the basic material to be converted into Bhasma, where Hingula (compound of Parada), Haratala, Gandhaka and manashila are employed as key converters in the conversion process under specially designed temperature panel (Gajaputa).

Thus obtained Pittala bhasma will have optimum bioavailability, increased specific activity at the target area, highly reduced particle size (Nano particle), and innate action on various hormonal, enzymatic, immunological pathways as it comprises mainstream trace elemental moieties.

Keeping these things in mind the present study entitled "A Comparative Pharmaceutico Analytical study of Pittala bhasma with two different maarana procedures" is taken for its basic standardization evaluation protocols.

METHODOLOGY:

The drug manufacturing is concentrated in every step for its,
1. Natural quality 2. Bioavailability 3. Making it a novel Nano molecule.

Aim: The main aim of the present study is to prepare good quality of two different methods of Pittala bhasmas

The objective includes:

1. Selection of genuine raw drugs
2. Shodhana of Raw Materials
3. Pittala maarana Method 1(HHPB) Hingula and Haratala maarita Pittala bhasma Reference: Rasa tarangini[1].
4. Pittala maarana Method 2(GMPB) Gandhaka and manashila maarita Pittala bhasma Reference: Rasa ratna Samucchaya[2].

Materials and Methods:

Main equipments: Khalwa Yantra, Dola yantra, Puta yantra, Weighing machine, big gas stove with Burner, Sharava samputa, and Pyrometer.

Method of preparation:

- Raw materials were collected after authoritative identification through grahya agrahya lakshanas.
- Samanya shodhana of Pittala was carried out in Nirvapa method in Medias like Taila, Takra, Gomutra, Aranala and Kulattha Kwatha for 7 times each[3].
- Vishesha Shodhana was carried out with nirgundi swarasa mixed with haridra churna for 7 times[4].
- Hingula shodhana for 7 days- bhavana with nimbu swarasa[5].
- Haratala shodhana for 1 yaama – Dola yantra swedana with churnodaka[6].
- Kumari swarasa for bhavana of method 1 Pittala bhasma.
- 250gm of Shodhita Pittala Patras, Shodhita hingula and Shodhita Haratala were taken where kumari swarasa was given bhavana to hingula and Haratala and the paste was applied to shoditha Pittala Patras kept for drying put in sharava samputa sandhibandhana was done and given Gajaputa 2 times as same. later Shodhita Pittala patras were fine and mixed along with maaraka dravyas(hingula and Haratala) with kumari swarasa bhavana chakrikas were made sharava samputikarana and Gajaputa was given.and for 3 more times the procedure was repeated.
- Gandhaka shodhana by kurma puta method[7].
- Manashila shodhana in choornodaka sthapana method[8].
- Nimbu swarasa for bhavana of method 2 Pittala bhasma.
- 250gm of Shoditha Gandhaka and shoditha manashila were taken nimbu swarasa was given bhavana to Gandhaka and manashila and the paste was applied to shoditha Pittala patras kept for drying put in sharava samputa sandhibandhana was done and given Gajaputa 2 times as same later Shodhita Pittala patras were fine and mixed along with maaraka dravyas (Gandhaka and manashila) with nimbu swarasa bhavana chakrikas were made sharava samputikarana and Gajaputa was given. And for 9 more times the procedure was repeated, where number of cow dungs was reduced from 4th puta onwards as the chakrikas were tightly adhered to sharava.
- Total 5 Gaja putas was given for method 1 where it was 3 gajaputa according to classics of method 1 and 11 Gaja putas was given for method 2 where it was 8 gajaputas according to classics method 2.

RESULTS

Pharmaceutico-Analytical study results are described under 2 headings.

1. Pharmaceutical results 2. Analytical results

1. Pharmaceutical Results:

Table no.01: Showing results of Hingula shodhana

No of *bhavana*	Quantity of *Hingula* taken	Quantity obtained	Gain	Yield
1	750gms	760gms	10gms	
2	760gms	768gms	8gms	
3	768gms	773gms	5gms	
4	773gms	778gms	5gms	**106%**
5	778gms	785gms	7gms	
6	785gms	790gms	5gms	
7	790gms	796gms	6gms	
Total			46gms	

Results of Haratala shodhana:

Weight of Haratala before shodhana of both the batches in Choornodaka:1155gms

Weight of Haratala after shodhana of both the batches in Choornodaka: 1110Gms

Loss: 45gms **Yield -96%**

Table no.02: Showing results of *Pittala samanya shodhana*

SL No	Name of liquid	Total Qty of liquid	Initial wt in gms	Final wt in gms	Gain/Loss in gms	Yield %
1	*Tila taila*	7lt	900	900	-	
2	*Takra*	7lt	900	894	6gm loss	**97%**
3	*Gomutra*	7lt	894	884	10gm loss	
4	*Kanji*	7lt	884	878	6gm loss	
5	*Kulattha Kwatha*	7lt	878	873	5gm loss	

Table no. 03: Showing results from *Pittala Vishesha Shodhana*

Wt of *Pittala* before *Shodhana*	Wt of Pittala after *Vishesha Shodhana*	Loss	Yield in %
878gm	865gm	8gm	98.5%

Table no. 04: Showing results of *Pittala maarana method 1*

puta	before	after	loss	yield
01	750gms	580gms	170gms	77.3%
02	750gms	390gms	360gms	52%
03	750gms	270gms	480gms	36%
04	270gms	200gms	70gms	74%
05	200gms	180gms	20gms	90%

Result: Quantity of Shodhita Pittala taken 250gm

Quantity of pittala bhasma obtained: 180gm

Yield-72%

Table no. 05: Showing results of *Gandhaka shodhana*

Batch	Wt of *Gandhaka* taken	Wt of Sh. *Gandhaka* obtained	loss	Yield
1	1000 gms	973 gms	27 gms	
2	973 gms	896 gms	77 gms	80.8%
3	896 gms	808 gms	88 gms	

Results of Manashila shodhana:

Weight of Manashila before shodhana of both the batches in Choornodaka:1000 gms

Weight of Manashila after shodhana of both the batches in Choornodaka: 976gms

Loss: 24gm

Yield-97.6%

Table no.06: Showing results of *Pittala maarana method 2*

puta	before	after	Loss	yield
01	750gms	710 gms	40gms	94.6%
02	750gms	670 gms	80gms	89.3%
03	750gms	590 gms	160gms	78.6%
04	750gms	510 gms	240gms	68%
05	750gms	425 gms	325gms	56.6%
06	750gms	398 gms	352gms	53%
07	750gms	360 gms	390gms	48%
08	750gms	310 gms	440gms	41.33%
09	310gms	270gms	40gms	87%
10	270gms	250gms	20gms	92.5%
11	250gms	210gms	40gms	84%

Result: Quantity of Shodhita Pittala taken 250gms

Quantity of Pittala bhasma obtained: 210gms

Yield-84%

Table no. 41: Showing Classical parameters of Method 1 and Method 2

Method 1(HHPB)		Method 2(GMPB)	
Varna	Kapota varna	Varna	Krishna varna
Sparsha	Smooth to touch	Sparsha	Smooth to touch
Gandha	odourless	Gandha	odourless
Varitaratva	Positive	Varitaratva	Positive
Rekhapoornatva	Positive	Rekhapoornatva	Positive
Unnama	Positive	Unnama	Positive

2. Analytical Results

Physical tests

Organoleptic characters:

Color, odour, taste of the given sample was tested using sensory organs, and the same were noted.

Table no. 07: Showing Organoleptic Characters of HHPB and GMPB

Physical test	HHPB	GMPB
Colour	Snuff color	Grey black
Odor	Characteristic	Characteristic
Taste	Tasteless	Tasteless
Texture	Fine powder	Fine powder

Showing results of Apunarbhava and Niruttha Pareeksha

Apunarbhava (HHPB)	Apunarbhava (GMPB)	Niruttha (HHPB)	Niruttha (GMPB)
Fine powder and no regaining of metallic form	Fine powder and no regaining of metallic form	No weight gain in the silver coin	2gm weight gain in the silver coin

Showing results of NPST[9]

Sample	I phase(0-5min)	II Phase(5-20min)	III Phase(20 min-1hrs)
HHPB	Dark green centred grey spot with yellowish brown periphery. Central spot disappeared within few seconds forming an inner dark black ring followed by outer light brown ring with spreading yellow periphery	Light pink central area, centre spot started fading towards light grey colour	Light grey coloured central spot surrounding a thin line encircling the spot with yellowish periphery
GMPB	There was no inner dark black ring.	Light bluish central area.	There was no thin line encircling the spot with yellowish periphery

PHYSICO-CHEMICAL PARAMETERS

Table no. 08: Showing Results of Standardization parameters HHPB and GMPB

Parameters	HHPB	GMPB
Loss on Drying at 105°C	0.13	0.06
Total ash	46.14	44.54
Acid insoluble ash	29.06	28.35
Water soluble ash	23.34	25.25
Water soluble extractives	2.25	2.45
Alcohol soluble extractives	1.51	1.53
Ph(5%aqueous solution)	5.35±0.10	5.31±0.10

TOTAL MICROBIAL COUNT:

Table no.09: Showing Microbial contamination of HHPB and GMPB

	HHPB	GMPB
Total aerobic count	Nil	Nil
Total fungal count	Nil	Nil

Table no. 10: Showing XRD report of HHPB compared with standard Pittala bhasma

2-Theta	d	Intensity	Height (Counts)
28.4727(14)	3.13228(15)	4.5043	13587(117)
47.4218(12)	1.91558(4)	5.556	7839(89)
32.127(7)	2.7838(6)	2.480	864(29)
46.098(6)	1.9674(2)	2.2889	2220(47)

Table no. 11: Showing XRD report of GMPB compared with standard Pittala bhasma

2-Theta	d	Intensity	Height (Counts)
28.517(2)	3.1275(3)	14.325	4349(66)
47.465(3)	1.91393(9)	15.888	2307(48)
31.369(4)	2.8493(3)	12.8305	1436(38)
48.723(3)	1.86740(11)	21.7751	1210(35)

Table no.12: Showing results of FTIR Peaks of HHPB

Sample peaks Cm^{-1}	Bond	Functional groups
3436.20	N-H(Streching) O-H(strong) broad streching	Primary amine Alcohol, intermolecular bonded
2922.03,2831.85	O-H(weak), broad, streching	alcohol
1631.80	N-H(medium) Bending C=C(medium), Streching	Amine, cyclic alkene, Conjugated alkene
1407.98	C-H bending S=O(strong) stretching	Alkene, methyl group Sulfate, sulfonyl chloride
1384.63	C-H bending(medium)	Alkane methyl group Aldehyde Alkane gem dimethyl
1184.49	C-O(Streching) C-N(streching)	Amine ester
1087.19	C-O(strong), stretching	Secondary alcohol Aliphatic ether
779.46	C=C, C-H(strong), bending	Alkene disubstituted 1,3 disubstituted
611.37	C-I, C-Br(strong), streching	Halo compound

Table no. 13: Showing results of FTIR Peaks of GMPB

Sample peaks Cm^{-1}	Bond	Functional groups
3435.77	O-H(strong), broad, stretching N-H(medium), streching	Alcohol, intermolecular bond Primary amine.
2921.55	O-H (strong, weak), broad streching	Carboxylic acid,alcohol,amine salt
2851.51	O-H(weak), broad, stretching N-H(strong), broad, streching	Alcohol Amine salt alkane
1632.38	C=C(medium), stretching N-H(medium)	Conjugated alkene, cyclic alkene, amine
1413.91	C-H(medium), bending O-H(medium), bending S=O(strong), streching	Alkane, methyl group Carboxylic acid sulfate
1384.51	O-H(medium), bending C-F(strong), stretching S=O(strong), stretching	Phenol Fluoro compound Sulfonyl chloride
1114.09	S=O(strong), stretching C-O(strong), stretching C-N(medium), stretching	Sulfone Amine Aliphatic ether Secondary alcohol

801.76	C-Cl(strong), stretching C=C(medium), bending C-H(strong), bending	Halo compound Alkene,trisubstituted 1,2,4trisubstituted 1,2,3,4tetra substituted
721.89	C-H(strong), bending C=C(strong), bending	1,3 disubstituted Alkene, disubstituted
638.47	C-I(strong)stretching	Halo compound
616.7	C-Br(strong) stretching C-I(strong) stretching	Halo compound

Table no. 14: Showing Particle Size of HHPB and GMPB

Sample	Mean diameter(nm)
HHPB	723.9nm
GMPB	601.4nm

Table no.15: Showing SEM EDS result of *HHPB*

Sl no	Element	Weight %	Atomic %
1	S K	21.39	35.29
2	Cu K	66.55	55.40
3	Zn K	7.77	6.28
4	As L	4.29	3.03

Table no. 16: Showing SEM EDS result of *GMPB*

Sl no	Element	Weight %	Atomic %
1	S K	38.07	57.42
2	Cu K	14.46	11.00
3	Zn K	9.79	7.24
4	As L	35.70	24.33

DISCUSSION

- **Hingula shodhana**: **Bhavana with nimbu swarasa** Mechanical trituration along with acidic media convert Hingula in to finer particles
- **Haratala shodhana: Swedana in Choornodaka:** Choornodaka is chemically "Calcium hydroxide when reacts with "Arsenic trisulphide' may form an intermediate product; known as **arsene** and further it may become **Calcium arsenate.** This compound may be as a safe and useful form of arsenic.

In this process the drug is boiled in the liquids, which are Ksharas, Amlas or both, and medicinal juices, with the help of Dolayantra. **Fluxation** process would have occurred in this kind of Shodhana.

According to Fick's law of diffusion:
Ds/dt-DA (dc/dx).

Where ds/dt - The rate of moment of solutes.

D-Diffusion constant. A- The area of planes, dc/dx- The concentration gradient .i.e. Difference between the Concentration between X and Y.

This law may holds good with swedana process. Here the impurities may move from the drug to the shodhana liquids and some organic qualities of liquids move from the liquids to the drug resulting in purification and potentization of the drug. And also it may be helpful in reducing the hardness of the drug as heat is given continuously through boiling liquids.

- **Pittala Samanya shodhana**

Different Medias like Taila, Takra, Gomootra, Aaranala and Kulattha Kwatha are used as media for Samanya shodhana. Each Drava has vishesha guna in exerting a new guna to the dhatu and also helps to remove visha guna. It prepares the metal to be brittle so that process of particle size reduction is assisted.

- **Samanya shodhana in Taila:**

Tila taila is considered as best among all tailas in classics For Samanya shodhana of all dhatus experts of Rasashastra have indicated Tila taila because of its sookshma and ashukari property, the veerya of sneha may enter into the interstitial areas of the hot metal and help in alleviating the rooksha guna vata dosha present in the metal (unwanted gaseous impurities).

- **Samanya shodhana in Takra:**

It is having teekshna, sanghata bhedana and shithileekarana properties. By these properties it may cause softening and breaking of the material.

- **Samanya shodhana in Gomootra:** Gomootra is having properties like teekshna, ushna, kshareeyata, dahana, pachana etc it may perform

ksharana of unwanted impurities and may help in smoothening the metal causing loosening of the bonds.

- **Samanya shodhana in Aaranala:** It is also having same properties like Takra and it may cause softening and breaking of the material.
- **Samanya shodhana in Kulattha Kwatha:** It has Ashmari bhedana property. By this property it may cause breaking of the material.
- **Pittala Vishesha shodhana**: In classics different procedures are explained for Pittala vishesha shodhana.

Heating and dipping in nirgundi swarasa mixed with Haridra churna for 7 times. Externally this procedure appears very easy but the main practical difficulty is nishkasana of nirgundi swarasa so the dried yavakuta churna of nirgundi was soaked overnight with sufficient quantity of water next day the swarasa was filtered and used.

Nirgundi according to acharya charaka considered it under vishagna gana (antipoisonous group of herbs) and krimigna.it is vishapaha anti toxic and antipoisonous

Whereas haridra has detox action, krimihara vishagna, Krimighna indicates it has all the property to detox and deworming so considering this it is used for vishesha shodhana of Pittala to remove the excess toxic or impurities if present.

- **Gandhaka Shodhana:** Since raw milk is the commonly recommended antidote for poisoning, it might help in neutralizing the sulfur poisoning. The organic sulfur present in the protein of milk might have a role in increasing bioavailability of inorganic sulfur.
- **Manashila shodhana:** Churnodaka is chemically 'calcium hydroxide' when reacts with 'arsenic trisulphide' may form an intermediate product know as arsenate and further it may become calcium arsenate. This compound will be safe and useful form of arsenic. Calcium is natural antagonistic of arsenic. This might be helpful in reducing toxic effects of Manashila

Method 1:Maarana with hingula and Haratala:
Acharyas were having strong reason for including Hingula as maaraka dravya. If Parada bhasma or Parada yukta dravya is used for Marana the bhasma will be considered as best. Because of its qualities like shadrasa, yogavahi and achintya veerya it may prove wonder effects in complete conversion of the basic material into bhasma acting like Agni in the concept of Pitara paka. As kumari swarasa is taken as bhavana media for this method, the extra electrons present in the Kumari swarasa media may be donated to the Marana dravya facilitating easy conversion. As it contains many inorganic trace elements, they are also added during trituration. Formation of slip can be suspected during mardana process as per metallurgy. Slip is the permanent or irreversible change in the shape of a body with the application of the load and the changed shape remains even after the removal of load. It is associated with permanent atomic displacement

Method 2: maarana with Gandhaka and Manashila
Gandhaka is the Ari loha for Tamra. As Tamra is the major constituent in brass in 2 ratios, Gandhaka helps in easy Marana of the drug as it has property to reduce the particle size, more the particle size reduction more the bioavailability. Gandhaka acts as reducing agent and facilitates the formation of bhasma easily. As per rasarnava dhatu bhasma can easily be prepared by the use of Gandhaka and Manashila as it will attain rasayana property and will be able to cure all diseases. As nimbu swarasa is taken as bhavana media for this method, acidic constituents of nimbu are helpful in disintegration of atoms of dhatu and formation of newer compounds.

ANALYTICAL DISCUSSIONS

- The pH value of HHPB and GMPB were 5.35±0.10, 5.31±0.10 respectively. Which implies that drugs are better absorbed from stomach. In acidic medium acidic drug is present in unionized form, which increases its absorption**.**
- In the present study HHPBand GMPB are having 0.13 and 0.06 respectively loss on drying at 105 ^{0}C. Hence it can be stated that all have very less amount of moisture content and very rare chance of bacterial and fungal growth.
- Acid insoluble ash of the HHPB and GMPB were 29.06% and 28.35% respectively. It signifies that lesser amount of silica material, dirt or sand in the sample.
- Mean particle size of HHPB is-723.9nm Mean Particle size of GMPB is-601.4nm The particle size has significant influence on dissolution rate. Smaller the drug particle size larger the surface area, leads to faster dissolution. Particle size reduction will result in precise drug delivery and thereby increasing the bio availability of the drug.
- The obtained peaks of the Pittala was compared with the standard peaks. It showed the presence of different functional groups like Alcohol, Amine salts, Alkanes, Alkenes, Bromide, Iodide, Chloride, Ethers, Carboxylic acids, Esters, Amines, Fluro, Halo compounds, Sulfone,

Primary and secondary amines and amides. This shows the presence of organic compounds in the drug.

- Elements found in HHPB is S, Cu, Zn and As in the percentage of 21.39,66.55,7.77,4.29. respectively, and in GMPB is also S,Cu,Zn,and As in the percentage of 38.07,14.46,9.79,35.70 respectively This shows that Copper zinc and sulphur are in great proportion and the elements may be in the form of sulphides and oxides. Variation in the percentage of the element might have also occurred due to heterogeneous mixing of the sample.

CONCLUSION:

- Pittala has been in use since Charaka's period. (2BC)
- Acharya Somadeva could be considered as the pioneer of introduction of Pittala into the field of Pharmaco-therapeutics.
- Shodhana has a definite role in changing the Structure, Mechanical properties, Chemical composition and Lattice points of Brass Crystal through the process of Quenching and Diffusion.
- Among different processes of Pittala Vishesha Shodhana, Nirvapa in Nirgundi swarasa mixed with haridra churna can be considered as appropriate one.
- Among different Maarana procedures of Pittala, Hingula Haratala Maarita Pittala Bhasma and Gandhaka Manashila maarita Pittala bhasma were taken to know the rationality behind the procedures.
- For Pittala Marana first 3 putas for both methods Gajaputa and then for remaining putas $3/4^{th}$ Gajaputa were found beneficial, and practical difficulty was experienced in Method 2 compared to method 1.
- Apunarbhava pareeksha of both the methods was almost similar and no regain of metallic property where as in Niruttha pareeksha weight of silver coin remained same as before in method 1 and increase of 2 gm. observed in method 2. This indicates proper formation of bhasma in method 1 when compared to method 2.
- Pittala Bhasma obtained of both the methods were analyzed by XRD studies. As per the report both the methods are having almost same findings.
- Quantitative estimation of Pittala Bhasma envisages Cu, Zn, S, As. Where it was found that arsenic % is slightly high in method 2 which may not be safe when compared to Method 1.
- As per the particle size analysis method 2 has got more reduction in the particle size compared to method 1.
- By considering Puta Sankhya Method 1 was properly prepared by giving 5 gajaputas whereas Method 2 was prepared by 11 gajaputas. Niruttha pareeksha suggests no changes in method 1 whereas in method 2 we see increase in weight of silver coin by 2gms.This suggests that Pittala bhasma prepared from method 1 is Best when compared to method 2.
- As per XRD data the Pittala Bhasma is in the form of Arsenic copper mercuric Sulphide and Zinc Sulphide. In this Arsenic copper mercuric Sulphide is in Rhombohedral structure and Zinc Sulphide in Hexagonal structure.
- NPST for Pittala Bhasma is not established. The Colour changes observed after 5min-Dark green centered grey spot, after 20min -light pink central area, after 24hrs -Light green coloured central spot with yellowish brown periphery was not indicative of either Cu or Zn. This signifies a new compound.
- By Considering the overall analysis of Both the methods, Method 1(HHPB) found to be the more accurate and appropriate when Compared to Method 2(GMPB).

FIGURES:

Fig no 1: Hingula shodhana with nimbu swarasa

Fig no 2: Haratala shodhana in choornodaka dola yantra

Fig no 3: Gandhaka shodhana

Fig no 4: Manashila sthapana in churnodaka

Fig no 5: Pittala patras

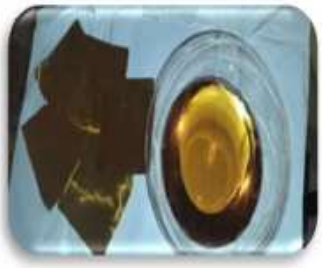

Fig no 6: Pittala nirvapa in Tila taila

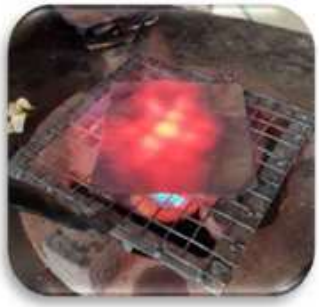

Fig no 7: Red hot heating of Pittala pathra

Fig no 8: Pittala nirvapa in Takra

Fig no 9: Pittala nirvapa in Gomutra

Fig no 10: Showing Bluish green flames

Fig no 11:Pittala nirvapa in Kanji

Fig no 12: Pittala nirvapa in Kulattha kwatha

Fig no 13: Hingula haratala lepita pittala patras

Fig no 14: Hingula Haratala lepita patras after 1 st puta

Fig no 15: Showing Chakrikas of method 1

Fig no 16: Gandhaka and Manashila lepita Pittala patras

Fig no 17: Chakrikas of Method 2

Fig no 18: Studding of chakrikas to sharava

Fig no 19:Rekhapurnatva

Fig no 20: Dadhipareeksha

Fig no 21: Varitaratva pareeksha

Fig no 22: Weight of Silver coin before niruttha

Fig no 23: Weight of Silver coin after niruttha pareeksha HHPB

Fig no 24: Weight of Silver coin after niruttha pareeksha GMPB

Fig no 25: Apunarbhava pareeksha of HHPB and GMPB

Fig no 26: NPST of method 1 in 5 mins of observation

Fig no 27: NPST of method 2 in 5 mins of observation

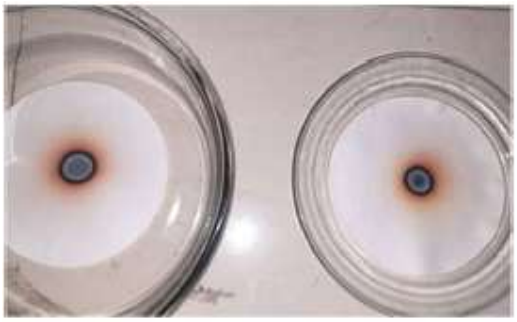

Fig no 28: NPST of both methods in 24 min observation

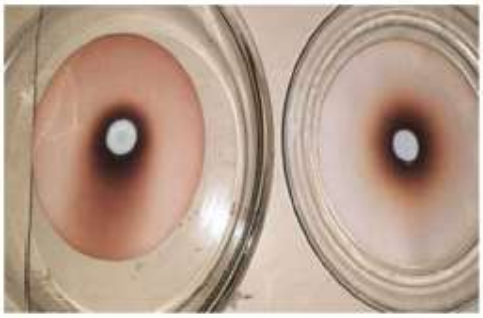

Fig no 29: NPST of both methods in 72hr observation

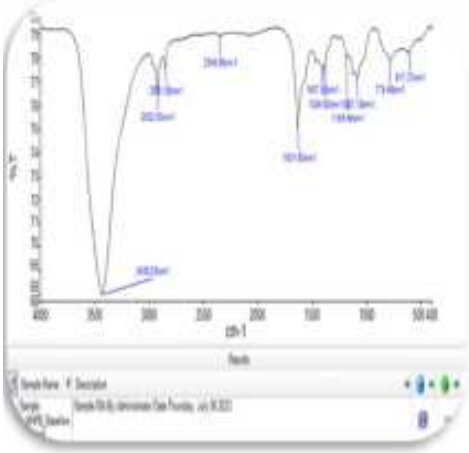

Fig no 30: FTIR reports of HHPB

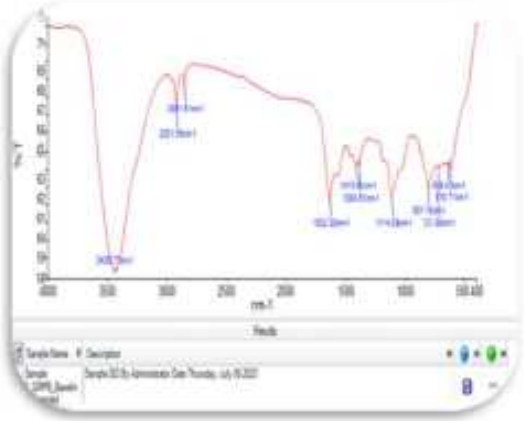

Fig no 31: FTIR reports of GMPB

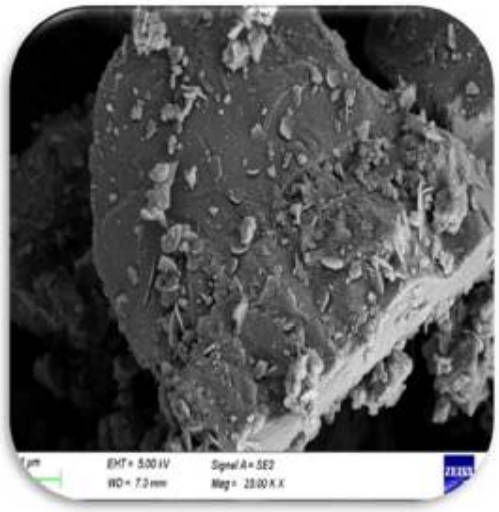

Fig no 32: SEM of method 1

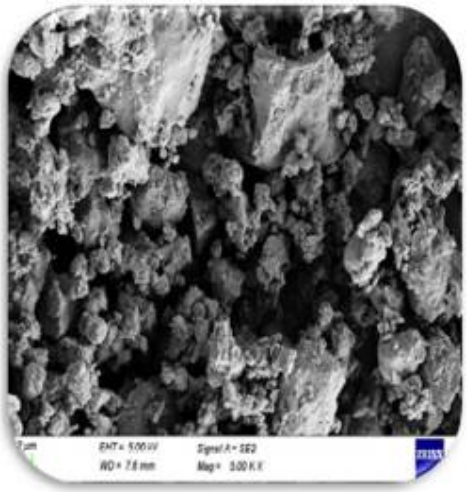

Fig no 33: SEM of method2

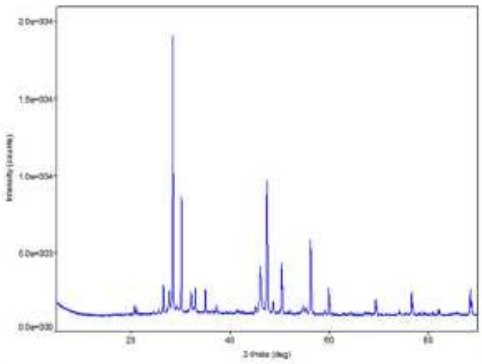

Fig no 34: Showing intensity of xrd method 1

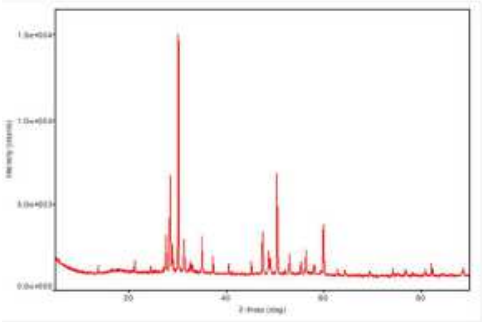

Fig no 35: Showing intensity of xrd method 2

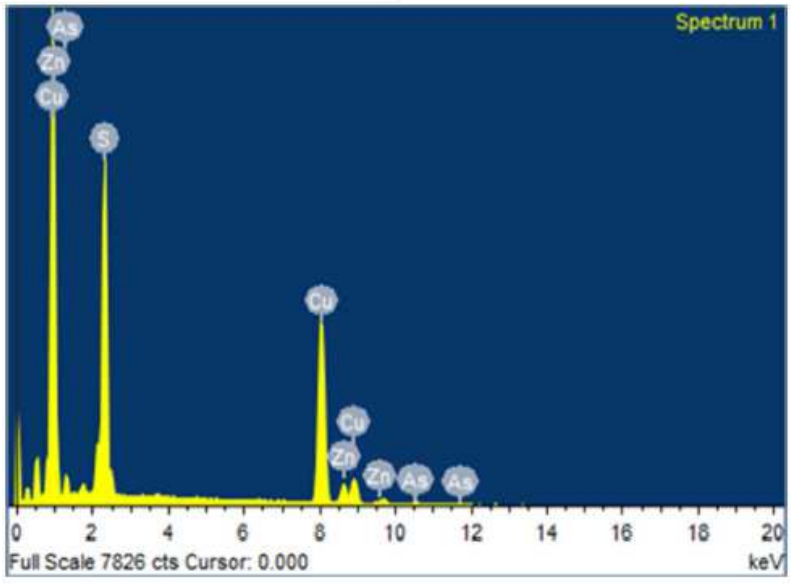

Fig no. 36

Showing intensity of SEM method 1

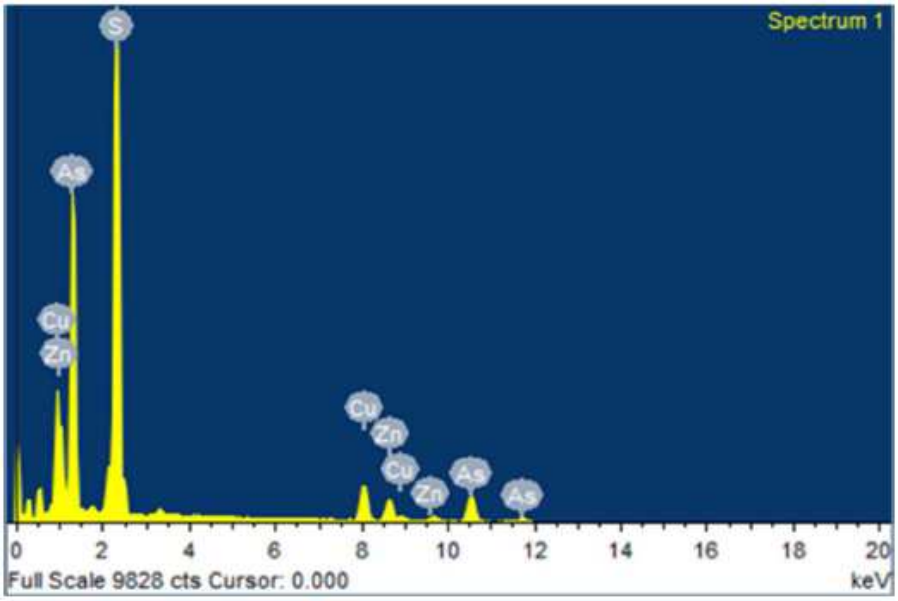

Fig no. 37

Showing intensity of SEM method2

QUALITY CONTROL LABORATORIES

ALN RAO MEMORIAL AYURVEDIC MEDICAL COLLEGE AND PG CENTRE

KOPPA, DISTRICT: CHIKMAGALUR, KARNATAKA, 577126

Reference Number: QC/ST/26/2023 **Date: 10th August 2023**

Purpose: Analysis for HHPB and GMPB.....

Result:

A. Organoleptic Characters

	HHPB	**GMPB**
Colour	Snuff color	Grey-black
Odour	Characteristic	Characteristic
Taste	Tasteless	Tasteless
Texture	Fine powder	Fine powder

B. Physico-chemical parameters

	HHPB	**GMPB**
Loss on Drying at 105°C	0.13%	0.06%
Total ash	46.14 %	44.545%
Acid insoluble ash	29.06%	28.35%
Water soluble ash	23.34%	25.25%
Water soluble extractives	2.25%	2.45%
Alcohol soluble extractives	1.51%	1.53%
pH (5% aqueous solution)	5.35 ± 0.10	5.31 ± 0.10

Patron: Honourable Shri Aroor Ramesh Rao

Laboratory is not liable to bear any legal action or dispute based on this report

QUALITY CONTROL LABORATORIES
ALN RAO MEMORIAL AYURVEDIC MEDICAL COLLEGE
AND PG CENTRE
KOPPA, DISTRICT: CHIKMAGALUR, KARNATAKA, 577126

C. Microbial contamination

	HHPB	GMPB
Total aerobic count	Nil	Nil
Total fungal count	Nil	Nil

References:

[1] Sadananda Sharma, Rasa tarangini, Kashinanth shastry ed, New Delhi, Motilal banarasidas publication, 11nth edition- 1979, 22nd chapter, 12-14 shloka, 569-573pp

[2] Shree Vagbhatacharya, Rasa ratna Samucchaya edited by Kaviraj shree ambikadatta shastry, 9th ed, Varanasi, Chaukambha Amara bharati publication, 1995, Chapter 5, 197 shloka 127pp.

[3] Acharya shree vaghbhata, Rasa ratna Samucchaya with siddiprada hindi commentary by Prof. Siddinandan Mishra, Varansi: Chaukambha Orientalia; 2019, 5th Chapter Loha varga 11 shloka, 143pp

[4] Sadananda Sharma, Rasa tarangini, Kashinanth shastry ed, New Delhi, Motilal banarasidas publication, 11nth edition- 1979, 22nd chapter, 9th shloka, 569-573pp

[5] Sadananda Sharma, Rasa tarangini, Kashinanth shastry ed, New Delhi, Motilal banarasidas publication, 11nth edition- 1979, 9th chapter, 16-17 shloka, 202pp

[6] Acharya shree vaghbhata, Rasa ratna Samucchaya with siddiprada hindi commentary by Prof. Siddinandan Mishra, Varansi: Chaukambha Orientalia; 2019, 3rd Chapter Uparasa varga 64 shloka, 65pp

[7] Shri Madhava Upadhyaya, Ayurveda Prakash with Arthavidyotini and Arthaprakashini Sanskrit and Hindi Commentary by Shri gulraj Sharma Mishra, Varanasi: Chaukambha Bharati Academy; 1999. 2nd Adhyaya, Gandhakadi uparasayanam Adhyaya verse 19, 260pp

[8] Sadananda Sharma, Rasa tarangini, Kashinanth shastry ed, New Delhi, Motilal banarasidas publication, 11nth edition- 1979, 11nth chapter, 109 shloka, 261pp

[9] Dr. Numburi hanumantha rao, manual of Numburi phase spot test year may 1997.