

**PHARMACEUTICO-ANALYTICAL STUDY OF ISABGOL BHAVITA RASA GARBHA POTTALI****Dr. Karthik Noolvi¹, Dr. Surekha Medikeri² and Dr. M. S. Doddamani³**¹Assistant Professor, Department of Rasashastra and Bhaishajya Kalpana, Sri Adi Siva Sadguru Allisaheb Sivaryula Ayurvedic Medical College, Guntakal, AP, India.²Guide, Professor and HOD, PG Dept. of RS&BK, GAMC, Bangalore, Karnataka, India.³Principal of GAMC, Shivamogga, Karnataka, India. Email ID: noolvikarthik@gmail.com.***Corresponding Author: Dr.Surekha Medikeri², Dr.M.S.Doddamani³**²Guide, Professor and HOD, PG Dept. of RS&BK, GAMC, Bangalore, Karnataka, India. ³Principal of GAMC, Shivamogga, Karnataka, India.

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ABSTRACT

Rasa Shastra is believed to have come into existence in about 6th and 7th century. Nagarjuna, the Buddhist sage, is considered the first to have used mercury (Parada) so extensively and is believed to be one of creators of treatment Methodology by Herbo-Minerals used in appropriate form. Pottali rasayana is one among the various mercurial compounds (Moorchita Parada yogas) processed with the help of sulphur. Pottali kalpana is based on its compactness. I.e. the medicine of large magnitude is compacted into a small pottali like structure. Detailed description of Pottali Rasayana is extensively available in the text 'Rasayoga sagara'. Various bhavana dravyas for preparation of pottali like Kumari swarasa, Tulasi swarasa, Ardraka swarasa etc... are mentioned in this text. In the current study Rasa Garbha Pottali (RGP) is prepared by the bhavana dravya 'Isabgol' (RGP-I). Gandhaka paka method was selected for the pharmaceutical processing and the change has been evaluated by Pharmaceutico-Analytical Study.

KEYWORDS: Rasagarbha Pottali, Isabgol, Pharmaceutico-Analytical Study.**INTRODUCTION**

There are a large number of potent medicines in Rasashastra which are described as Rasayana. Apart from a number of combinations in "Rasayan adhikara" lot of compounds described in various other chapters that work principally as rasayana but are better indicated in that particular disease. They mostly contain various substances having rasayana property e.g. Rasa sindoor, Swarna bhasma, elements of Maharasa group and different Ratnas etc.

Mercury (Parada) is considered to be a very powerful medicine. When mercury is properly processed, it balances all three doshas, has a soothing effect on the body and prevents diseases and old age. When it is compounded with specific herbs it heightens its medicinal properties. Mercury is said to give a firm physique, a stable mind, and to be the best destroyer of disease.^[1]

Khalviya rasayana, Parpati rasayana, Pottali and Kupipakwa rasayana are the four unique compound formulations of Mercury.

"Pottali" is considered as effective form of mercurial formulation. Minimization of dose and also maximization of effect are the inbuilt qualities of

"Pottali". Rasagarbha Pottali is a classical Pottali rasayana containing Hingulottha Parada, Kajjali, Shodhita Gandhaka and Swarnatanutantu Khanda^[2], which is Unique, Potent, and fast effective medicine. While explaining Rasagarbha pottali different bhavana dravyas are mentioned.

The present study assess the Pharmaceutico-Analytical Study of 'Rasagarbha pottali' (RGP) prepared by the bhavana dravya 'Isabgol' (RGP-I).

AIM

To prepare Isabgol bhavita Rasa garbha Pottali (RGP-I) by Gandhaka drava paka method and evaluating its Pharmaceutico-Analytical results.

OBJECTIVES

- To Carry out Vishesha Shodhana of Swarna.^[3]
- To prepare Samaguna Kajjali.^[4]
- To Prepare RGP by Bhavana dravya 'Isabgol'.^[5]
- To carry out Pharmaceutical and Analytical study of RGP-I.

MATERIALS AND METHODS

Materials

Major raw materials

Swarna, Hingula, Gandhaka

Associated Drug

Kanchanara Patra Swarasa, Nimbu swarasa, Saindhava Lavana, Go-dugdha, Isabgol, Silk cloth.

Equipments

Khalwa Yantra, Urdhwa patana Yantra, Kurma puta, Valuka yantra, Gas stove, Vessel, Kora Cloth, Knife, Spoon, Utensils, Multani mitti, Loha sharava, Valuka, Loha shalaka, Thread, Cow dung cakes, Match stick, Glass beaker, Scissor etc.

Method

The whole method of preparation includes

Extraction of Parada from Hingula^[6]

Parada is extracted from Hingula by the Hingulottha Parada method mentioned in Rasa Tarangini.

From 860 g of Hingula 507 g of parada obtained. It is taken into a porcelain mortar and 31.68 g of Haridra churna added and triturated for 3 days and filtered and 480g of Parada was collected with the loss of 27 g.

Gandhaka Shodhana^[7]

Gandhaka Shodhana is carried out in Godugdha by subjecting it to Kurma Puta by Bhoo dhara Yantra method as mentioned in Ayurveda Prakasha. 710-730g of Gandhaka is taken for Shodhana each time. Totally: 45.770 kg gandhaka Shodhana done.

Shodhita Gandhaka is of pale Yellow Colour with greenish tinge & shiny.

It is in granular form and few were streak like, fully immersed in the milk.

Visesha Shodhana of Swarna^[8]

The method mentioned in Yogaratnakara is followed. 2.587g of Swarna Patras are cut into small layer like pieces and heated to red hot in a mild flame and suddenly quenched into Kanchanara patra swarasa and washed in warm water. Same procedure is repeated for 2 more times. For each time of Nirvapa fresh sample of Kanchanara patra Swarasa was used.

Distribution of kajjali for Pilot study and Main study

Kajjali for	Wt. before bhavana	Wt. after bhavana	Wt. gain	For pilot study	kajjali for main study
RGP-I	238 g	270 g	31.4 g	100g	120g

50 g of kajjali is taken for Analytical study

Preparation of Swarna Pisti^[9]

2.587g of Shodhita Swarna was cut into small pieces and added slowly into Khalva yantra containing 41g of Shodhita Parada and triturated. Amalgamation of Swarna and Parada was taken place after 6 hrs of mardana.

After complete formation of Pisti, Nimbu swarasa and Saindhava Lavana was added and triturated well. After 3 hrs of trituration swarasa colour turned into greyish black. The Pisti was then washed with luke warm water, until the water stopped turning into black colour and all the acid content disappeared.

Then this Swarna Pisti was collected and weighed. The final product of prepared Swarna Pisti weighs 43.587g.

Preparation of Kajjali^[10]

331 g of Parada and 331 g of Gandhaka were taken in a clean Khalva Yantra. Then gently triturated with uniform speed till all the Kajjali Lakshanas were observed, i.e. the whole mixture converts into a fine, smooth, lustreless powder.

Average to and fro movements of Peshani was 14-15 times/minute.

After 72 hrs, Kajjali was taken between thumb and index finger made wet then rubbed and was exposed to sunlight, minute particles were observed in furrows of finger confirming Rekhapurnatva test. Nischandra, Varitara, uttama test was confirmed. Obtained kajjali is 662 g.

Preparation of Final Kajjali for RGP

In a Khalva Yantra 43.587 g of prepared Swarna Pisti is taken. To this 10.35g of Gandhaka is added and triturated properly till it is properly mixed.

Later the above mixture is mixed with 662 g of prepared kajjali and again trituration continued. After 72 hrs Kajjali appeared Smooth and Rekhapornata test found positive. For better fineness and smoothness of kajjali, mardana was continued up to 280 hrs.

Distribution of RGP Kajjali For Isabgol bhavana^[11]

238.6 g of kajjali triturated by 200 ml Isabgol for 7 days.

Pilot Study

	Kajjali	7 days Bhavana	Poogakara Pottali
RGP-I	96 g	60 ml Isabgol	8 pottali : 8.5g, 8.5g, 9.5g, 9.5g, 9g, 10g & 10g

Table Result after Gandhaka paka of RGP-I

Pottali	Paka kala	Weight [g]	
		Before paka	After paka
1	45 min	8.5	8.5
2	1:30hrs	8.5	8.5
3	3hrs	9.5	9
4	5hrs	9.5	8
5	6hrs	9.5	8
6	7hrs	9	7.5
7	8hrs	10	7
8	9hrs	10	7

The Paka kala of RGP-I known by Pilot study is: 08 hrs. I.e. 06 hrs after the melting of sulphur

	Dried Poogakara Pottali
RGP-I	3 pottalis of 34g, 34 g, 34 g

Main Study

Purva Karma

Equal quantity of Suddha Gandhaka to that of dried RGP-I was taken and made into four parts. Four layers of Silk cloth were taken. Each part of Suddha Gandhaka was spread on every layer of silk cloth. Then the layers were arranged one above the other.

After this the well dried RGP-I was placed in the centre of the top layer silk cloth.

Then the four layered silk cloth wrapped around the Pottali and tied with cotton thread at the centre and perpendicular to iron rod for the convenience in the Pottali paka.

A Loha patra (iron vessel) of wide mouthed vessel with the measurement of 20cm x 55cm (height x diameter) was taken. 3-4 cm height of Valuka was spread evenly in the loha patra. Then the pot which was 10x12x13 cm

(height x top width x middle width) was placed at the center. Then the rest portion of the Loha patra covered by Valuka so that the pot was immersed up to the neck portion. Total Valuka was taken: 13 kg.

Pradhana Karma

Shodhita Gandhaka was filled in the pot and kept in the Valuka Yantra. Then the arrangement was placed on the gas stove. Thermocouple was properly placed i.e., 5-6 cm away from the pot in Valuka Yantra and 4 cm above the bottom of Valuka Yantra.

Pooja done by chanting of "Aghora Mantra". Fire was set and temperature reading was carried out with the help of pyrometer with thermocouple for every fifteen minutes. Mridu agni tapa was maintained according to classical reference.

As soon as Gandhaka melts Rasa garbha Pottali was immersed in it. Heating continued throughout the process till the appearance of Pottali paka Laksanas Mrudvagni was given i.e., temperature was maintained between 190° C to 215°C.

Observed for accomplishment of Pottali Siddha Lakshana like Vyoma varna for molten Gandhaka, Metallic sound was heard when banged against pot. Burning of silk cloth.

After attaining these features the Pottali was then removed and placed in an empty pot and was allowed for self-cooling.

Paschat Karma

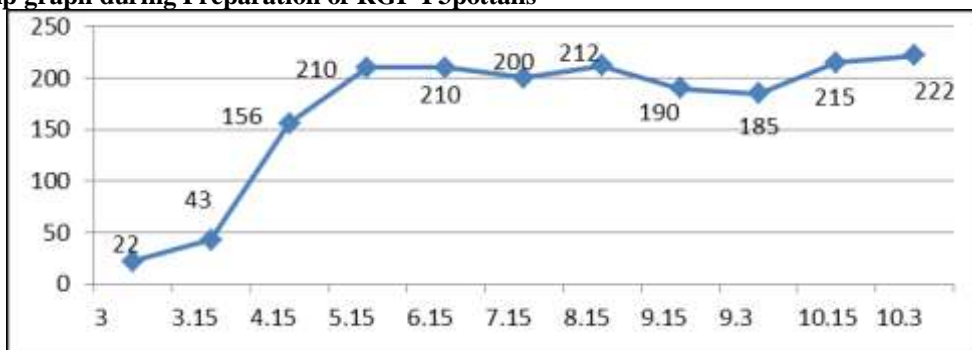
After self-cooling of the Pottali. Burnt silk cloth and Sulphur which was adhered to the Pottali was removed. Then the Pottali surface was cleaned and polished with the help of sharp blade and sand paper. Then the final product was collected in an air tight container.

Temperature pattern and Observation of RGP-I.

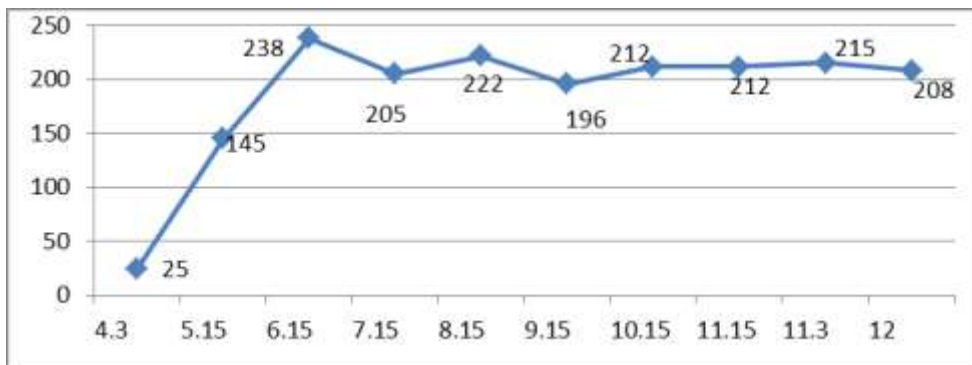
Time	Temp (°C)	Observation
3.00 am	22 ⁰ C	Fire ignited
3.15 am	43 ⁰ C	
3.30 am	76 ⁰ C	
3.45 am	101 ⁰ C	Gandhaka started melting
4.00 am	135 ⁰ C	
4.15 am	156 ⁰ C	Scum removed
4.30 am	178 ⁰ C	Pottali immersed
4.45 am	189 ⁰ C	
5.00 am	217 ⁰ C	Golden yellow of sulphur is observed
5.15 am	210 ⁰ C	Thin layer scum started to appear and they are removed
5.30 am	205 ⁰ C	
5.45 am	200 ⁰ C	
6.00 am	203 ⁰ C	yellow colour of sulphur is observed

6.15 am	210 ⁰ C	
6.30 am	210 ⁰ C	
6.45 am	202 ⁰ C	Scum collected at the surface of paka removed
7.00 am	200 ⁰ C	
7.15 am	200 ⁰ C	
7.30 am	201 ⁰ C	
7.45 am	204 ⁰ C	
8.00 am	209 ⁰ C	Dark Brown colour of sulphur is observed
8.15 am	212 ⁰ C	
8.30 am	218 ⁰ C	
8.45 am	201 ⁰ C	
9.00 am	196 ⁰ C	
9.15 am	190 ⁰ C	Thin layer scum started to appear and they are removed
9.30 am	185 ⁰ C	
9.45 am	193 ⁰ C	
10.00 am	208 ⁰ C	
10.15 am	215 ⁰ C	Bluish black colour of sulphur is observed
10.30 am	222 ⁰ C	Pottali removed

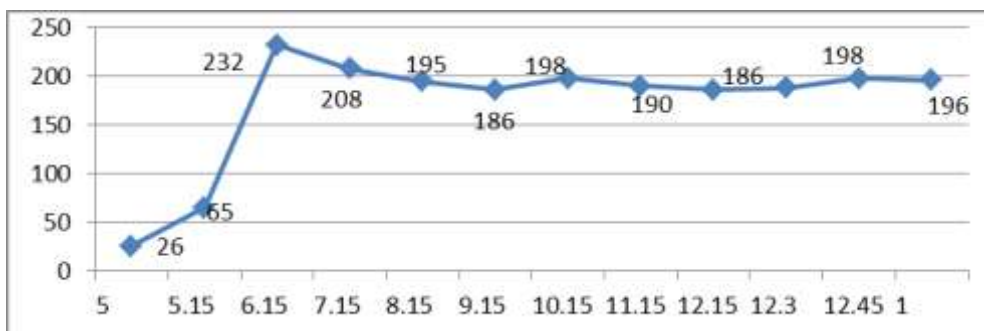
Time & Temp graph during Preparation of RGP-I 3pottalis



RGP-I 1



RGP-I 2



RGP-I 3

RESULTS

Pharmaceutical Study

Yield of Preparation of Hingulottha parada

Extraction of Parada from Hingula	Initial Wt. of Hingula (860g)	Wt. of parada extracted	Loss	parada Obtained in %	Total Yield in
1 st Batch	230g	135 g	95g	58.69	507g 59.05 %
2 nd Batch	200g	120 g	80g	60	
3 rd Batch	230g	130 g	100g	56.52	
4 th Batch	200g	122 g	78g	61	

Yield of Gandhaka after Shodhana

Total Gandhaka taken: 48.210 kg

Total loss: 2.440kg

Total yield: 45.770 kg

Observations made during Swarna Pisti

Swarna Pisti	Shuddha Swarna Patra	Hingulottha Parada	Nimbu Swarasa	Saindhava Lavana	Swarna Pisti after Prakshalana	Loss during Pisti
1	2.587g	41g	60 ml	1 pinch	43.587g	0

Pilot Studies: The Paka kala of RGP-I: 08 hrs. I.e. 06 hrs after the melting of sulphur

Main Study

Observations of RGP-I

RGPI	Duration Hrs	Wt. Before Gandhaka Paka	Wt. After Gandhaka Paka	Loss (g)	Total Before Paka	Total After Paka	Total Yield
1	6	32 g	28.5g	3.5	1100 g	89g	11 G Loss (11%)
2	6	34 g	30.5 g	3.5			
3	6:30	34 g	30g	4			

Analytical Results

Classical Parameters

Sl. No.	Test	RGP-I
1	Sparsha	Smooth and soft
2	Gandha	Characteristic Smell.
3	Rekhapurnatva	Fine powder of RGP-I entered the furrows of the fingers.
4	Varitaratva	Fine powder of RGP-I was floating on the surface of water in a test tube.
5	Nischandratva	There was no shining particle in the finely powdered RGP-I even when it was rubbed between thumb and index finger and made wet, observed in the bright Sunlight.

Organoleptic Characters

Sample	Colour	Odour	Appearance	Taste
RGP-I	Black	Characteristic	Amorphous	NO

Qualitative and Quantitative Study

Physical Tests

Sample	P ^H Value	Ash Value	Acid insoluble ash	Water soluble ash	Loss on drying
RGP-I	5.13	14.90%	1.10%	0.75%	0.00%

Chemical Tests

Percentage of Mercury and Gold

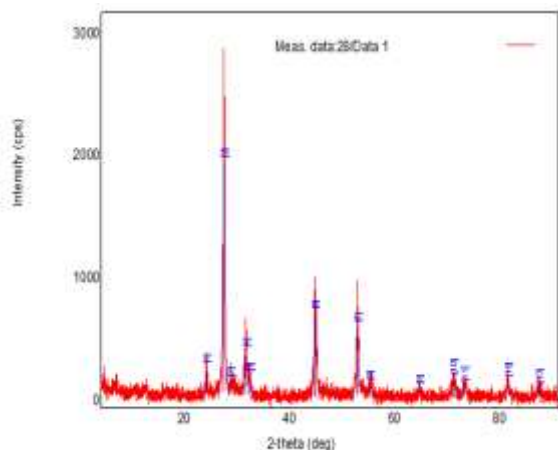
Sample	Total Mercury	Mercurous Mercury	Mercuric Mercury	Free Mercury	Gold
RGP-I	14.25 %	2.70 %	11.55 %	0.00%	0.42 %

Estimation of Sulphur by Eschka Method

Sample	Total Sulphur	Sulphide	Sulphate	Free Sulphur
RGP-I	6.00 %	5.20 %	0.80 %	Nil

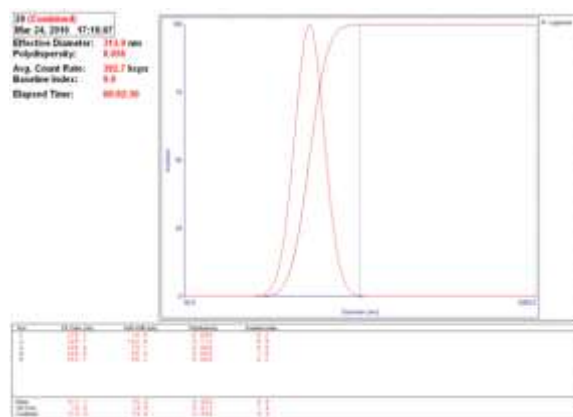
Showing FT-IR Peak values of RGP-I

Pottali	Functional Group
RGPI	Amides, Carboxylic acids, Ketone, Aromatics, Secondary amines, Esters, Alcohol, Alkenes, Bromides, Iodides



Practical Size

Particle Size	Effective diameter	Half width diameter
RGP-I	Mean diameter- 317.1nm Std error-14.6 nm Combined- 313.9nm	Mean diameter- 76.0nm Std error-14.6 nm Combined- 74.6nm



RGP-I

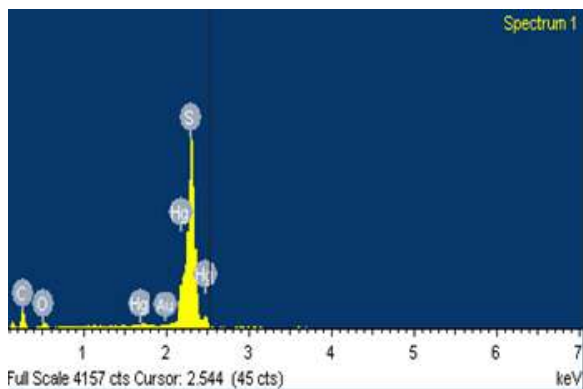
X-Ray Diffraction Results

Sample	RGP-I
Compound Name	Meta-cinnabar Gold Sulphide
Chemical Formula	Hg Au ₂ S
Crystal Structure	Cubic Cubic

RGP-I

SEM-EDX

Elements	RGP-I	
	Wt. %	At %
C	22.05	58.10
O ₂	4.20	8.05
S	27.06	26.02
Hg M	46.11	7.03
Au M	0.58	0.80



RGP-I

DISCUSSION

R.G.P. is a Sagandha, Sagni, Bahirdhooma, Gandhaka jaarita, Kajjali bandha Pottali Kalpana containing Parada, Shuddha Gandhaka churna, Swarnatanutantu Khanda.

It is explained by Pandith Hariprapannaji in Rasa yoga sagara along with other Pottali Kalpanas. It can be used in Shwasa, Kaasa, Rajayakshma, Jeernajwara & Sannipathaavastha along with Rogochitha Pathya.

Kajjali Mardana: After 72 hrs Kajjali appeared Smooth and Rekhapornata test found positive. For better fineness and smoothness of kajjali, mardana was continued up to 280 hrs.

Bhavana dravya

Since the Isabgol or *Psyllium Ovata*, contains high fiber that varies from 75 % to 80%, and a polysaccharide *Mucilage*, these properties attributes the *Laxative* and *binding* property to the RGP-I.

Paka kala and Compactness of Pottali

RGP-I Paka kala is estimated as 6 hrs.

Pottali is hard but its shape 'Poogakara' is retained but slightly compressed because of fiber and elastic property of Isabgol.

PH of RGP-I is slightly acidic in Nature

As it possess least amount of 'Acid insoluble ash' and on par with standards, which signifies that, a considerable amount of drug is soluble in the acidic media of stomach.

It has least 'water soluble ash value', indicating that water is not soluble media for it. *So salivary secretions, gastric enzymes* play an important role in its dissolution.

'Loss on drying at 110⁰C' is 0.00%, hence RGP-I has least amount of moisture content and very rare chance of bacterial and fungal growth. The drug is having least hygroscopic activity with less chances of contamination. Concurrently it can be stated that the shelf life of the drug in the present study is more.

As the number of trituration period increased and effect of Gandhaka paka it is observed that there is increase in percentage of *Mercuric mercury* i.e. RGP-I: 11.55 % and decrease in percentage of *Mercurous mercury* i.e.. RGP-I: 2.70 %. "Means after subjecting to Gandhaka paka *Mercurous mercury* is less compared to the *Mercuric mercury*" This clearly indicates that RGP-I contains more *mercuric mercury* form rather than the *Mercurous form*.

'Percentage of Free Sulphur' is Nil. This clearly indicates by doing Kajjali and Gandhaka paka there is a reduction in *free sulphur* and it forms more bondage with mercury.

There is no drastic change in the percentage of Gold in before Gandhaka paka and after Gandhaka paka. i.e. '0.42%'

XRD: The d-space and 2 theta values of the sample RGP-I when compared with the standards, confirmed the presence of cubic crystal of Meta-cinnabar (Hg) and Gold sulphide (Au₂S).

EDAX: RGP-I: Shows Presence of C, O₂, S, Hg and Au elements in slight difference in their percentage.

The change percentage of elements may be due to the heat treatment, which causes breaking of bond and the formation of new bond with the evaporation of certain gases like SO₂ resulting in the increase and decrease of other elements.

FTIR: Analysis Shows Presence of *Amides, Carboxylic acids, Ketone, Aromatics, Secondary amines, Esters, Alcohol, Alkenes, Bromides, Iodides*.

This shows the presence of organic compounds in the drug. Here milk and ghee may be the source for *Amines, Iodides*, and *Esters*. Nimbu swarasa is the source for

Carboxylic acids. Isabgol may be the source of *amines* and *Carboxylic acids*.

Particles Size: Mean particle size of: RGP-I is 317.1nm

CONCLUSION

Pottali Kalpana can be understood as a specific Pharmaceutical technique which is intended for keeping different constituents in their processed, purified, incinerated, sindhoora form into unique complex formula.

By analyzing the Pharmaceutical points one can conclude that, RGP-I can be prepared in 6 hrs of Paka kala. Paka kala should be optimum. Giving more heat may break the pottali into cracks and its hardness will reduce.

Shape of RGP-I was retained in Poogakara even after Gandhaka paka but slightly compressed because of fiber and elastic property of Isabgol.

'Loss on drying at 110⁰C' it can be stated that "The drug is having least hygroscopic activity with less chances of contamination."

A considerable amount of drug is soluble in the acidic media of stomach since it possess least amount of 'Acid insoluble ash'

Shape of RGP-I is retained in Poogakara even after Gandhaka paka.

The drug is composed of cubic crystal of Meta-cinnabar (Hg) and Gold sulphide (Au₂S) and Presence of C, O₂, S, Hg and Au elements.

It also contains *Amines, Iodides, Chloride, Esters* and *Carboxylic acids*. It is having least hygroscopic activity with less chances of contamination of drug.

317.1nm is the particle size of Isabgol bhavita Rasa garbha Pottali.

Isabgol as a *laxative*, the property is attributed to the pottali.

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