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Pharmaceutico analytical study of *Taala Garbha Pottali*

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ABSTRACT

Rasashastra is a pharmaceutical branch of Indian system of medicine which mainly deals with the metals, minerals and poisonous drugs. These drugs are pharmaceutically processed and rendered fit for internal administration. There are four type of *Rasakalpa* viz: *Khalwiya*, *Parpti*, *Kupipakwa* and *Pottalirasayana*. *Pottalikalpana* is an unexplored, innovative drug form of *Rasashastra*, even though it has many advantages like least product wastage, minimal drug requirement when compared to other *Rasayogas*. Its manufacturing and applied research became gradually less in current era. It is a type of *Parada Murchana* which was invented with a vision for achieving convenience in transporting, preserving, minimum dosage form and some cases in emergency conditions. *Taalagarbhapottali* is a unique formulation explained in *Rasayogasagara*. Preparation of *Taalagarbhapottali* is done by *Gandhakapaka* method using *Sodhita Haratala*, *Ashtasamskaritaparada*, *Gandhaka* and *Swarna Varka*.

Key words: *Taalagarbhapottali*, *Gandhakapaka*, *Sodhita Haratala*, *Ashtasamskaritaparada*, *Gandhaka*, *Swarna Varka*

INTRODUCTION

Haratala (*Arsenic trisulphide*) is known as yellow orpiment, one of the most ancient and potent drug explained in our classics. As *Haratala* contains *Arsenic* it is considered as highly toxic, it has to be subjected for *Sodhana* and *Marana*. *Acharya Charaka* mentioned, “*Yogadapi Visham Teekshnam Uttamam Bheshajam Bhavet Bheshajamchap Duryuktam Teekshnam Sampadhyate Visham*”^[1] which means with proper preparation a highly poisonous substance can become

excellent medicine.

Among various *Rasayoga*, *Pottali* is considered as effective form of mercurial formulation which gives better results in a very minimum dosage. *Pottalikalpana* is specific pharmaceutical technique which is intended for keeping different constituent their processed, purified, incinerated form into unique complex formula. *Rasashastra* during its progressive development introduced different pharmaceutical preparations. *Pottalikalpana* is very potent because of its unique method of preparation and the way of administration. *Taalagarbhapottali* is one such preparation where in the raw materials required like *Haratala*, *Parada*, *Gandhaka* and *Swarna*. *Taalagarbhapottali* is a unique formulation beneficial in disorders like *Swasa*, *Kasa*, *Vatavyadhi*, *Raktaslehma Roga*.^[2]

Taala Garbha Pottali

It is one among *Rasa Yoga*, which is prepared by *Pottalikalpana* method.

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Taalagarbhapottali a compound word consists of 3 components,

Taala - Haratala

Garbha - That which consist essence of all things in a single mass.

Pottali - that which tied and formed in to compact mass.

In total a mass or bolous prepared by using Taala as an main ingredient so it is termed as *Taala Garbha Pottali*. There is no reference of *Taala Garbha Pottali* in prevedic, vedic and in Samhita periods. It is mentioned in the text of *Rasayoga Sagara*.^[3]

Haratala Bhasma - 4 Pala

ParadaBhasma - 2 Karsha

Sudha Gandhaka - 1 Tanka

Sudha Swarna Varka - 6 Ratti

Gritakumari - Q.S

As per classic where in *Pottali Rahasyam* the description mentioned below. Instead of *Haratala Bhasma*, *Sudha Haratala* can be used and instead of *Parada Bhasma*, *Sudha Parada* can be used.

Matra - ½ Ratti

Anupana - *Ardraka Swarasa*, *Madhu*, *Anupana* as per diseases.

Rogadhikara - *Swasa*, *Kasa*, *Vata Vyadhi*, *Rakta Sleshma Roga*.

Pathya - As per diseases

Mode of Administration

It is usually administered by rubbing over stone for desired number of rotations with honey or ghee either sub lingual or orally. The number of rotations is to be decided by the physician according to the nature, severity of the disease and age of the patient.

Methodology of Pottali Paka

In the preparation of *Pottali* following points are taken in consideration especially in the medium of molten sulphur

1. Preparation of *Swarna Pisti*
2. Preparation of *Kajjali* for *Tala Garbha Pottali*
3. *Bhavana* of *Misrana* with *Kumari Swarasa*
4. *Pradhana Karma-Gandhaka Paka*
5. *Paschat Karma*

Selection and collection of raw drugs

Raw drugs was procured from the market after confirming the genuineness Authentication based on *Grahya Lakshanas* mentioned in the classical textbooks and available modern parameters.

Pharmaceutical Procedures

Table 1: Procedures

SN	Process	Method	Ingredient	Reference
1.	<i>Haratala Sodhana m</i>	<i>Dolayanra Swedanam</i>	<i>Kanji, Kushmanda Swarasa, Tila Taila, Triphala Kashaya</i>	A.P ^[4]
2.	<i>Ashta Samskara</i>	<i>Swedana, Mardana, Murchana, Utapana, Patana, Rodhana, Niyamanam, Deepanam</i>	As recommended for each process	R.H.T ^[5]
3.	<i>Gandhaka Sodhana</i>	<i>Kurma Puta</i>	Milk, ghee	A.P ^[6]
4.	<i>Swarna Sodhana</i>	<i>Nirvapa</i>	<i>Kanchanara Swarasa</i>	Y.R ^[7]
5.	<i>Taalagarbha Pottali</i>	<i>Gandhaka Paka</i>	<i>Sudha Haratala, Parada, Swarna, Gandhaka</i>	R.Y.S ^[8]

1) Preparation of Swarna Pisti

Materials

Sodhita Swarna - 375 mg

Ashta Samskarita Parada - 12 gm

Equipments - *Khalwa Yantra*, steel vessel, spoon, filter

Procedure

Sodhita Swarna Varka cut in to small pieces and poured slowly in to *Khalwa Yantra* containing *Ashtasamskarita Parada*. Immediately continuous trituration was carried slowly by using *Peshani* using more pressure. As *Mardana* continued with in 5 min the piece of *Swarna* turned into silver, movement of *Parada* became slow. Light greyish colour on *Parada* and consistency of *Parada* became hard. After 10 min, *Swarna* completely turned into silver colour and greyish powder coating was floating over the *Pisti*. As the process continued within half an hour amalgamation taking place slowly. After 1hr 52min complete amalgamation took place and *Pisti* was formed, then it was filtered.

Table 2: Showing result T.G.P Swarna Pisthi

<i>Sudha Swarna Patra</i>	<i>Ashta Samskarita Parada</i>	<i>Swarna Pisti</i>	Loss during <i>Pisti</i>
375mg	12 gm	12.28 gm	0.095

2) Preparation of *Kajjali* for *Tala Garbha Pottali*

Materials

Swarna Pisti - 12.28 gm

Gandhaka - 1.5 gm

Sudha Haratala - 96 gm

Equipments - *Khalwa Yantra*

Table 3: Showing observation of *Taala Garbha Pottali Kajjali*

Hours	Observation
0 min	<i>Swarna Pisti</i> + <i>Gandhaka</i>
1 min	<i>Gandhaka</i> changed to light grey color
5 min	Big particles of <i>Pishti</i> became small
15 min	Greyish green color with shiny particles
30 min	Color changed to steel grey

1 hr	Streak with more shiny particles
5 hr	Color turned black
10 hr	Black powder with shiny particles
26 hr	<i>Kajjali</i> + <i>Haratala</i> added
60 hr	Attained <i>Rekhapurnata</i> and <i>Slakshnata</i>
65 hr	Small shining particles still present
70 hr	<i>Nischandratva</i> test was positive

Precaution taken

- *Mardana* was done carefully and in uniform speed to avoid spillage
- All *Kajjali Pareeksha* was performed and confirmed

3) *Bhavana* of *Misrana* with *Kumari Swarasa*

Drugs Used: T.G.P *Kajjali* - 106 gm

Kumari Swarasi - 550 ml

Apparatus: *Khalwayantra*, mixer grinder, spatula

Kumari Swarasa : pH - 5, colour - colourless, Taste - *Kashaya*

Table 4: Showing observation of *Taala Garbha Pottali Bhavana* with *Kumari Swarasa*

Day	Date	Qty of <i>Kumari Swarasa</i>	Duration of <i>Bhavana</i>	Observation
1.	18/7/21	120 ml	24 hr	Greenish yellow colour of <i>Kajjali</i> turned to light yellowish
2.	19/7/21	90 ml	24 hr	Yellowish colour and sticky
3.	20/7/21	90 ml	24 hr	Hissing sound during trituration
4.	21/7/21	85 ml	24 hr	Yellow colour <i>Kalka</i>

5.	22/7/21	70 ml	24 hr	Yellow colour <i>Kalka</i>
6.	23/7/21	50 ml	24 hr	Yellow colour <i>Kalka</i>
7.	24/7/21	45 ml	24 hr	Mustard yellow colour <i>Kalka</i> , and <i>Subhavitha</i> <i>Lakshana</i> attained

Precautions

- *Khalw Yantra* should be clean and dry before the process started.
- During trituration *kumara Swarasa* added to it if *Kalka* dries up

Table 5: Result of Bhavana with Kumari Swarasa

Initial wt of T.G.P <i>Kajjali</i>	109.5gm
Sample kept for analysis	3.5 gm
Qty of <i>Kajjali</i> used for <i>Bhavana</i>	106 gm
Qty of <i>Kumara Swarasa</i> used	550 ml
Wt of <i>Kajjali</i> after <i>Bhavana</i>	232 gm
Gain of wt after <i>Bhavana</i>	126 gm

Shape of Pottali

After proper trituration, fine paste is made into *Pottali*. Regarding the shape of *Pottali*, different opinion are encountering in *Rasasastra*.

- *Sikharaarambikaakara* - Resembling the shape of pyramid
- *Pugakara* - Look like *Pugaphala* in size and shape
- *Karsyamanascavartika* - In the shape of *Varti* and approximately weighing of 1 *Karsha*.

4) Preparation of Taala Garbha Pottali

a) Purva Karma

- Preparation of *Pottali* for *Gandhaka Paka*
- Placing of *Gata* in *Valuka Yantra*.

b) Pradhana Karma

- Uniform heating pattern
- Observation and recording of temperature
- Maintaining the *Gandhaka* level

c) Paschat Karma

- Removal of *Pottali* from *Gandhaka* media
- Removal of debris around the *Pottali*
- Collection of final product.

Pradhana Karma

Table 6: Showing temperature pattern during preparation

SN	Time	Temperature		Observation
		Sand	Sulphur	
1.	5.00 pm	32.4	33.1	<i>Agni</i> is ignited, 2 kg Of <i>Shuddha Gandhaka</i> taken. <i>Mandagni</i> was given
2.	5.05	38	34.1	
3.	5.10	67.1	34.8	
4.	5.20	94.1	38.7	
5.	5.30	103.2	40	
6.	5.45	107.2	45.5	<i>Gandhaka</i> started melting slowly
7.	6.00	140.8	46.1	
8.	6.15	142	48.3	
9.	6.30	144.1	50.6	
10.	6.45	146.5	56.2	200 gm <i>Gandhaka</i> added

11.	7.00	151	71	
12.	7.15	179	82	
13.	7.30	182	90	
14.	7.45	200	107.5	
15.	8.00	212	110	Sulphur fumes started appearing
16.	8.15	224	120	
17.	8.30	229.5	124	250 gm of <i>Gandhaka</i> added
18.	8.45	231	127	
19.	9.00	235.6	132	
20.	9.15	235.8	135.2	Complete melting of <i>Gandhaka</i>
21.	9.30	246	142.2	
22.	9.45	252	146.4	Golden yellow colour of sulphur is observed
23.	10.00	258.7	147.5	
24.	10.15	259	149	
25.	10.30	262	153.5	Sulphur turns brownish red in colour
26.	10.45	263.2	154.7	
27.	11.00	271	159.1	
28.	11.15	274.5	160.4	Viscous
29.	11.30	276	166.8	
30.	11.45	278.2	169	<i>Gandhaka</i> attained dark brown colour
31.	12	280	172	
32.	12.15	282.	173.5	
33.	12.30	283.2	175	
34.	12.45	285	178	

35.	1.00	287	180	
36.	1.10	300	182	Metallic sound heard

RESULT

Table 7: Showing Result of Taala Garbha Pottali

SN	Sample 1		Sample 2		Sample 3	
	Wt. before Paka	Wt. after Paka	Wt. before Paka	Wt. after Paka	Wt. before Paka	Wt. after Paka
1.	8.08gm	11.75	8.5	12.25	8.64	12.4
2.	8.34	12.1	8.39	11.8	8.53	12.2
3.	2.88	4.71	2.95	4.72	2.86	4.4

Total duration of heat : 8 hr 10 min

Table 8: Showing result of XRF report of Taala Garbha Pottali

Found elements name	Concentration
S	24.03
As	9.59
Fe	6.402
Hg	1.65
Mg	1.257
Al	0.6504
Si	0.5228
Sb	0.1427
K	0.1008
Ca	0.08263
Cl	0.04113
P	0.03231
Mn	0.02976

Ba	0.01688
Ge	0.01609
Sn	0.01375
Cu	0.01064

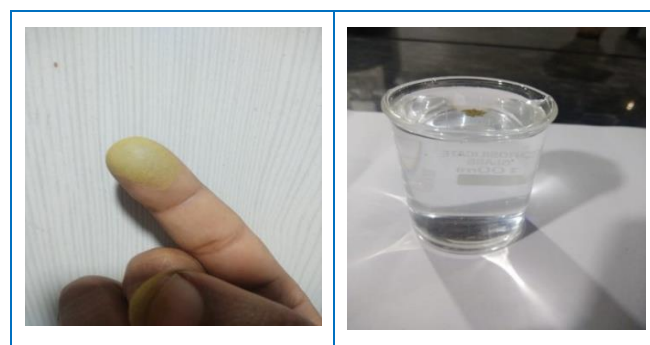
Table 9: Showing result of XRF report of Taala Garbha Pottali

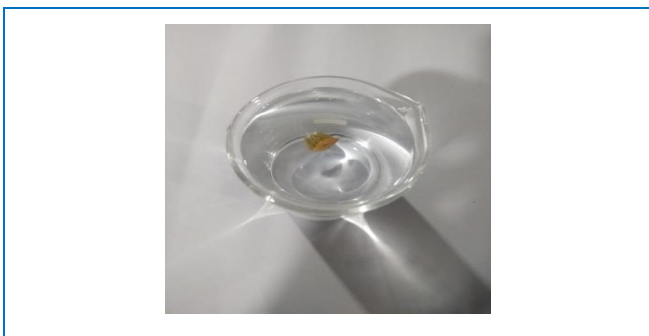
Elements	Concentration
Sulfideoxide	60.01 %
Arsenic	9.590 %
Ironoxide	9.153 %
Magnesiumoxide	2.09 %
Mercury	1.650 %
Aluminumoxide	1.229 %
Siliconoxide	1.118 %
Antimony	0.1427 %
Potassiumoxide	0.1215 %

Picture 1: Showing preparation of Kajjali of Taala Garbha Pottali



Kajjali Pareeksha



**Bhavana of Kajjali with Kumari Swarasa****Kalka after Bhavana**

DISCUSSION

Result of EDAX

Ashudha Haratala: Arsenic content is 36%, sulphur 53%, oxygen 6.66%, carbon 3.33%, iron 0.04%

The Edax report shows percentage of elements tally with chemical formula of orpiment.

Shodhita Haratala: Arsenic content is 34.98%, oxygen 7.33%, carbon 3.66%. Report shows reduction in percentage of arsenic whereas increase in amount of carbon and oxygen. This increased carbon and oxygen due to interaction of different media used during *Sodhana*.

Before Bhavana: Arsenic content is 23.61%, oxygen 23.82%, iron 1.36%, mercury 1.48%, gold 0.06%. Before *Bhavana* arsenic and sulphur almost equal to orpiment and addition of sulphur also shows in result. Percentage of Hg and gold equal to ratio taken for the procedure. Percentage of O and C increased due to interaction of different media used during *Sodhana*.

After Bhavana: oxygen 49.38%, carbon 24.68%, sulphur 9.22%, arsenic 8.26%. Percentage of arsenic and sulphur decreases and carbon, oxygen increases. Iron content increases due to *Bhavana* with *Kumara Swarasa*. Au and Hg level decreases after *Bhavana*.

After Paaka: arsenic 6.22%, mercury 0.13%, iron 7.49%, oxygen 43.26%, gold 0.08%, sulphur 20.83%. Percentage of sulphur increases due to *Paka* in sulphur bath. Percentage of Au and Hg decreases and Fe is almost same due to maximum 200°C not enough for reaction.

Swaanga: Oxygen 41%, arsenic 5.72%, sulphur 24.28%, gold 0.15%, iron 6.72%. Percentage of sulphur increases due to the duration contact with sulphur is more here. Oxygen and carbon content decreases here.

XRD of TGP

Before Bhavana: Angle (2θ) at 18.38 shows maximum peak of arsenic trisulphide. Mercuric sulphide also detected. Unidentified compound also observed.

Before Paaka: Angle (2θ) at 18.373 (19) at 100 relative intensity shows arsenic trisulphide. 4 unidentified elements were observed at intensity ranging from 80.31 – 22.89 at (2θ) 27.91 – 31.21.

After Paaka: Angle (2θ) at 26.43 at 100 relative intensity and it might be crystalline phase of mercuric sulphide. At relative intensity of 30, angle (2θ) 18.31, it was detected as arsenic trisulphide. Other 5 main other elements were observed at intensity ranging from 29.88 – 55.78 at (2θ) 23.93 – 26.43.

Swaanga: Angle (2θ) at 26.34 at 100 relative intensity. 5 main other elements were observed at intensity ranging from 26.89 – 66.81 at (2θ) 18.31 – 43.58. Change of major peaks detected after *Swaanga Seetha*. 30% - 60% sulphur peaks were observed. So, it might be due to the contact with sulphur for more duration.

Hammered sample: Angle (2θ) at 24.48 at 100 relative intensity. 5 main other elements were observed at intensity ranging from 19.25 – 24.48 at (2θ) 19.25 – 23.93. Here concentration difference was observed in major phase and minor phase when compared to rubbed sample. It can be concluded that *Pottali* should be rubbed instead of hammering as mentioned by *Acharyas*.

CONCLUSION

XRF Report of TGP 1 shows almost 50 elements, where 9 elements are having concentration above 1000ppm. Sulphur is having maximum concentration of 24.03%. Elements like iron, aluminium, silicon, potassium etc. might have been incorporated from the drug used for *Shodhana* and *Bhavana*. It was observed that by hammering, crystalline phase change was detected in XRD analysis. So, it can be concluded that *Pottali* should be rubbed as mentioned by *Acharya*.

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