A RESEARCH ON PHARMACUTICAL PREPARATION OF TAMRA GARBHA POTTALI

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ABSTRACT
Ayurveda a science of life bloomed on its own concepts of health maintenance and curative aspects. One of the prenomial off shoot of Ayurveda is Rasashastra, an Indian alchemy. Pottali kalpana is a peculiar pharmaceutical dosage form, is unique in terms of its preparation, mode of administration, quick in action, less dose and easy for transportation. Tamra Garbha pottali (TMGP) is one such herbo-mineral-metallic complex formulation containing Tamra bhasma (T.B), Shodita Swarna, Hingulotta Parada and Shodhit Gandhaka. Among the different pharmaceutical methods, Gandhaka paka method is considered to be the best method to enhance the properties of the drugs and to keep them in a concise form.

Pilot study of 6 Pottalis was conducted to standardize the temperature required to do Pottali paka and to assess the Pottali siddi lakshanas like Vyoma varna of Gandhaka paka, hardness of Pottali and changes of silk cloth tied to the Pottali. The main study conducted in 2 batches on the standards made by the pilot study. Observations made on the time duration required for the study, temperature to be given to Paka, changes in the Gandhaka varna till attainment Vyoma varna noted. The Study gave standard pharmaceutical method of Pottali paka w.s.r to Tamra garbha pottali.

KEYWORDS: Tamra Garbha pottali, Tamra bhasma, Pottali, Pottali siddha Laksana, Gandhaka Paka.

INTRODUCTION

Rasashastra is one of the prenomial off shoot of Ayurveda which deals with the herbo-mineral formulations. Ever since the inception of Hindu Alchemy by Parada and Gandhaka, it’s evolution lead to series of compounds and formulations. Pottali is one such formulation. Pottali word was used for different purposes in Ayurvedic literature. The word Pottali is derived as पूट – पोट – पोट्टलि – पोट्टलिका |

Here the word Puta applied to minimize, to concise or to make compact having Pratyaya, further from the root La with “I” Pratayya meaning to take or to receive, thus the word Pottali formed. Among the different Pottalis mentioned in classics, Tamra Garbha Pottali (TMGP) is Sagandha, Sagni, Murchita parada yoga, congaing ingredients like Tamra bhasma, Shodhit Swarna, Hingulotta Parada, Shodhit Gandhaka, a generic formulation have its distinct role therapeutically. It is the need of the hour to explore pharmaceutical aspect of the formulation. Hence present study made an effort to set a standard manufacturing procedure for Tamra Garbha pottali preparation which is indicated in many of disorders like Kaphajanya and Tridoshajya Shwasas, Kaasa, Jvara, Shula, Vardhakya, and Shosha.

MATERIAL AND METHODS

Preparation of Kajjali & Tamra bhasma

Parada extracted from Hingula through Hingulotta parade⁴¹ method. Gandhaka shodhana carried out in Kurma putal² method. Equal quantity of Hingulotta Parada and Shodhit Gandhaka are mixed in a Khvalya yantra and Mardhana carried out till attainment of Kajjali siddi lakshanas for 150 hours.

Pure Suchi vyadha Tamra patras taken and subjected to Shodhana⁵ and Vishesa shodhana⁶ as per the classical reference. Tamra bhasma was prepared according to the classics⁵ using Samaguna Kajjali and Nimbru swarasa as media. Gandhaka which is stated as Shulvari⁶ is taken as Marana media in the successive Putas. Tamra bhasma was subjected to various classical parameters of Bhasma pareeksha along with Amla dadhi pareeksha which is specific for Tamra bhasma, all found positive after 31st Pata. Amritikarna⁶ of Tamra bhasma was carried out as per the classical reference.

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**Preparation of Tamra Garbha pottali**

The method of preparation was according to the *Rasayogasagara*(7). In classics different opinions are there regarding the duration of heat for *Pottali paka*. Hence, pilot study was carried out initially to assess the temperature and duration of heat required to attain *Pottali siddhi lakshanas*. 6gm of *Hingulottha Parada* and 750mg of *Shodhit Swarana patras* were triturated to prepare *Dhatu pishiti*. *Datu pishiti prakashalana* was carried out with *Nimbu swarasa* and *Saindhava*. 10 gm of *Shodhit Gandhaka* added to *Dhatu pishiti* trituration carried out till attainment of *Kajjali siddhi lakshanas*.120gm of *Tamra Garbha* was added to the prepared *Kajjali*, trituration carried out for 24 hrs as said in classics. *Kumari swarasa bhavana* was given to the *Tamra Garbha Pottali kajjali* for 7 times. Slight weight gain was observed after 7 *Bhavana. Shikararambha* (conical) shape given to the *Pottali* after 7th *Bhavana* and dried under shade. 6 *Pottalis* weighting 12gm each were prepared for pilot study and two *Potalis* weighting 1 Pala each were prepared for main study. The dried *Tamra Garbha pottali* tied in 4 layered silk cloth, which is spread with *Shodhit Gandhaka* (1/4th part of *Pottali* wt) in each layer, and tied to a *Loha shalaka*, immersed in *Druta Gandhaka* in a *Mrit patria*. *Mrittakra* was kept at the centre of *Valuka yantra*. *Mandagni* was given throughout the procedure. Pyrometer was kept in *Valuka* 5cm always from *Mrittaka* to assess the temperature. The observations and results were noted systematically. After attainment of *Pottali siddhi lakshanas*, *Tamra Garbha pottali* taken out of *Gandhaka paka*, allowed for *Swangasheeta*, adhered *Gandhaka* was scraped and stored in a air tight container.

The whole procedure of *Tamra Garbha pottali Kalpana* will be divided under 3 headings as follows.

| Table 1: The whole procedure of Tamra Garbha pottali Kalpana |
|-------------------------------------------------------------|
| 1. Purva karma | a. Preparation of Pottali for Gandhaka Paka  |
|                | b. Placing of Mritt patria in Valuka yantra  |
| 2. Pradhana karma | a. Uniform Heating Pattern |
|                  | b. Observation and Recording of Temperature |
|                  | c. Maintaining the Gandhaka level |
| 3. Paschat karma | a. Removal of Pottali from Mritt patria |
|                 | b. Removal of debris around the Pottali |
|                 | c. Collection of Final product |

**Observations**

| Table 2: Observations made during Swarna Pisti |
|-----------------------------------------------|
| **Swarna Pisti** | **Shuddha Swarna Patra** | **Hingulottha Parada** | **Nimbu Swarasa** | **Saindhava Lavana** | **Swarna Pisti after Prakshalana** | **Loss during Pisti** |
|------------------|------------------------|------------------------|-------------------|--------------------|-------------------------------|----------------------|
| 1                | 750mg                  | 6gm                    | 30 ml             | 1 pinch            | 9gm                          | 0                    |

**Table 3: Showing different phases of Tamra Garbha Pottali Kajjali during Trituration**

| Hours     | Observation                                      |
|-----------|--------------------------------------------------|
| At 0 min  | *Swarna Pisti* + *Gandhaka*                     |
| After 5 min | Light Grey with small *Swarna Pisti* particles |
| After 30 min | Greyish green colour with shiny particles     |
| After 1 Hour | Yellow streaks with more shiny particles     |
| After 5 Hours | Colour turned to Black                      |
| After 10 Hours | Black powder with shiny particles             |
| After 50 hours | flakes adhered to *Khalwa*.                  |
| After 100 hours | flakes started to merge with *Kajjali* powder. |
| After 150 hours | flakes reduced, shining particles seen in *Kajjali* |
| After 210 Hours | *Kajjali* + *Tamra bhasma*                   |
| After 214 Hours | Mixture became homogeneous                     |
| After 220 Hours | *Rekha purnata* & *Shlakshnata*              |
| After 230Hours  | *Varitara* test was positive                   |
| After 234Hours  | Shining particles were reduced                 |
### Table 3: Bhavana with Kumari svarasa

| Quantity of Kumari | Duration of Bhavana | Observation |
|--------------------|---------------------|-------------|
| 1 40 ml            | 4 ½ hr              | Colour was blackish gray with persistent irritant odour. |
| 2 40 ml            | 4 hrs               | Colour was black with persistent irritant odour. |
| 3 40 ml            | 4 ½ hrs             | Colour was black with persistent irritant odour. |
| 4 40 ml            | 4 ½ hrs             | Colour was black. |
| 5 40 ml            | 4 hrs               | Colour was black with slight irritant odour |
| 6 40 ml            | 4 hrs               | Colour was black. |
| 7 40 ml            | 3 ½ hrs             | Colour was black with reduced irritant odour. |

### Table 4: Temperature pattern and Observation - Pilot study of Tamra Garbha pottali

| Time             | Temp (°C) | Observation                                                                 |
|------------------|-----------|------------------------------------------------------------------------------|
| 4.15am           | 26        | Agni is ignited, 4800 gm of Shuddha gandhaka taken. Gandhaka started melting slowly |
| 7.15 am          | 187       | Complete melting of Gandhaka. Pottali is immersed in molten sulphur          |
| 8.15 am          | 208       | Golden yellow colour of sulphur is observed                                  |
| 8.45 am          | 209       | 1<sup>st</sup> Pottali was taken out @ 1 ½ hr                                |
| 9.15 am          | 202       | Sulphur turned to dark brown colour                                         |
| 10.15 am         | 235       | Colour of sulphur turned to dark brown, S fumes became denser, 2<sup>nd</sup> Pottali was taken out @ 3<sup>rd</sup> hr |
| 11.15 am – 2.15pm| 222 - 228 | Dense fumes of sulphur seen, thick layer of scum was removed, Gandhaka attained dark brown colour |
| 12.15 – 1.15 pm  | 228 - 239 | Gandhaka attained Reddish brown colour, 3<sup>rd</sup> Pottali was taken out @ 6<sup>th</sup> hr |
| 1.15 – 2.15 pm   | 239       | Reddish brown colour of Gandhaka, Viscosity of Gandhaka increased            |
| 2.15 – 3.15 pm   | 226       | Bluish tinge in colour of Gandhaka started to appear, 4<sup>th</sup> Pottali removed @ 8<sup>th</sup> hr (Metallic sound heard) |
| 3.15- 4.15 pm    | 225       | Gandhaka turned to chocolate brown colour, Dark bluish reflects of Gandhaka observed, 5<sup>th</sup> Pottali removed @ 9<sup>th</sup> hr (Metallic sound clearly heard) |
| 4.15 – 5.15 pm   | 224       | Gandhaka fumes reduced                                                      |
| 5.15 - 6.15 pm   | 223- 239  | Observed for Vyoma varna of Gandhaka, burning of silk cloth, metallic sound of Pottali |
| 6.15 – 7.15pm    | 239- 248  | 6<sup>th</sup> Pottali removed @ 12<sup>th</sup> hr                         |

### Table 5: Temperature record during – Tamra Garbha pottali Paka - Batch I & II

| Duration (hrs) | Temperature (°C) Batch I | Observation Batch I | Temp (°C) Batch II | Observations Batch II |
|----------------|--------------------------|---------------------|--------------------|-----------------------|
| 0 – 2 hrs      | 25⁰ - 185⁰C              | Complete melting of Gandhaka. TMGP immersed in molten Sulphur. | 26 – 185           | Complete melting of Gandhaka. Tamra Garbha pottali immersed in molten Sulphur. |
| 2 – 3 hrs      | 185 – 208                | Golden yellow colour of sulphur is observed | 185 – 200          | Golden yellow colour of sulphur is observed |
| Time Interval | Observations |
|---------------|--------------|
| 3 – 4 hrs     | 208          |
|               | Thin layer of scum started to appear, Sulphur turned to dark brown colour |
|               | 200 – 213     |
|               | slight fumes of ‘S’ started to appear. ‘S’ turned to dark yellow colour |
|               | Thin layer of scum was removed. |
| 4 – 5 hrs     | 215 – 225     |
|               | Dark brown colour of Gandhaka is observed. Sulphur fumes became denser. |
|               | 213 – 219     |
|               | Dark brown colour of Gandhaka is observed. Sulphur fumes became denser. |
| 5 – 6 hrs     | 225 – 229     |
|               | Colour of sulphur was dark brown with red tinge |
|               | 219 – 222     |
|               | Colour of sulphur was dark brown with red tinge |
| 6 – 7 hrs     | 229 – 228     |
|               | Dense fumes of sulphur seen. Thick layer of scum was removed. |
|               | 222 – 223     |
|               | Dense fumes of sulphur seen. Thick layer of scum was removed. |
| 7 – 8 hrs     | 228 – 230     |
|               | Gandhaka attained Reddish brown colour. |
|               | 223 – 226     |
|               | Gandhaka attained Reddish brown colour. |
| 8 – 9 hrs     | 230           |
|               | Viscosity of Gandhaka increased. |
|               | 223           |
|               | Viscosity of Gandhaka increased. |
| 9 – 10 hrs    | 230           |
|               | Bluish tinge in colour of Gandhaka started to appear. Gandhaka fumes reduced. |
|               | 223           |
|               | Bluish tinge in colour of Gandhaka started to appear. Gandhaka fumes reduced. Slight burning was observed in 1st layer of silk cloth. |
| 10 – 11 hrs   | 230 - 232     |
|               | Observed for Vyoma varna of Gandhaka, burning of silk cloth, metallic sound of Pottali. At the end of the 11th hr Pottali taken out of Mrith patra. |
|               | 223           |
|               | Observed for Vyoma varna of Gandhaka, metallic sound of Pottali. At the end of the 11th hr Pottali taken out of Mrith patra. |

**Graph no1: Showing the temperature pattern of Batch I - Tm.G.P**
DISCUSSION

Tamra Garbha pottali is a Sagandha, Sagni Murchita Parada yoga containing Tamra bhasma, Shodhit Swarna, Hingulotta Parada and Shodhit Gandhaka, a complex herbomineral formulation. It is a unique Pottali rasayana prepared with Gandhaka paka method in Mridu agni. The method of Pottali paaka has still remained a topic which needs a standard to assess the Pottali paaka lakshanas, which may vary according to drugs used like Swarna, Rajatha, Abhraka bhasma, Manashila, Haratala bhasma, Bhasmas of Sudha varga dravyas etc, according to the Agni and its duration. In a nut shell, 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. This specific technique developed for potentiating the constituents, stabilizing firm bonding between the constituents forming a coordinating complex with high therapeutic efficacy.

Dhatu pishiti was prepared by mixing Shodhit Swarna with Hingulotta parada (Table 02) Mardana carried out till it convert into silvery white colored intermetallic compound with metallic luster. Total 6 hr Mardana was carried out to attain above said Lakshanas.

\[ 2Au + Hg \rightarrow Au_2Hg \text{ (intermetallic compound)} \]

\textbf{Pishti prakshala} with Nimbhu swara and Saindava lavana helps in removing the impurities and finely powdered Shodhit Gandhaka was added to the Swarna pishiti, Mardana carried out for 210 hrs till attainment of Kajjali siddi lakshanas like Kajjalabhasa, Nishchandrata.

Tamra bhasma mixed to the Dhatu pishiti Kajjali and Mardhana carried out for 24 hrs\(^{\ast}\) which lead to the formation of a complex compound. Fresh Kumari Swarasa was added to TMGP Kajjali and trituration was done for 4 hrs. This process carried out for 7 days. Bhavana with Kumari swarasa was not a mere Bhavana media in turn which helps in particle size reduction, uniform mixing of Kajjali and potentiating the product by converting the free elements into compound form and addition of organic compounds by heating process (chemisorption). Kumari swarasa is also acts as a binding agent, which helpful in giving Shikarambha Akara to the Tamra Garbha pottali before going to Pottali paka.

### Table 6: Result after Gandhaka paka

| Pottali | Colour        | Weight Before Paka | Weight After Paka |
|---------|---------------|--------------------|-------------------|
| 1       | Greyish black | 11.5 gm            | 12 gm             |
| 2       | Dull black    | 12 gm              | 12 gm             |
| 3       | Black         | 12.5 gm            | 13 gm             |
| 4       | Black         | 13 gm              | 13 gm             |
| 5       | Jet black     | 12.5 gm            | 13 gm             |
| 6       | Jet black     | 12 gm              | 12 gm             |

### Table 7: Result before and after Gandhaka paka

| Result                                      | Batch I | Batch II |
|---------------------------------------------|---------|----------|
| Weight of Tamra Garbha pottali before Paka  | 48.5 gm | 48 gm    |
| Weight of Tamra Garbha pottali after Paka   | 46.5 gm | 46.5 gm  |
| Loss of weight After Paka                   | 2 gm    | 1.5 gm   |

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A Potti weighing 48gm is prepared and dried under shade. Drying is a process where addition-elimination reaction helps in formation of complex molecule by removal of water/gaseous particles (condensation reaction). Tamra Garbha pottali was tied in 4 layered silk cloth and sandwiched with equal qt of Shodhit Gandhaka powder to that of dried Tamra Garbha pottali made into 4 parts.

Preparation of Tamra Garbha pottali

Pilot study was carried out to assess the duration and range of temperature for Tamra Garbha pottali. Initially Shodhit Gandhaka was taken in a mud pot and kept in Valuka yantra, made into Drutha (liquid) form. During the entire procedure Mridu agni i.e., 160°-240° was maintained with the gradual increase from room temperature to the specific temp mentioned. The same pattern was followed for the main study, which is helpful in the formation of complex compound under pressure through liquid sulphur media.

OBSERVATIONS

1. Characteristic sulphur odour perceived at 150°C i.e., after half an hour of heating.
2. Complete melting of whole sulphur after two hours of heating.
3. The Tamra Garbha pottali was immersed after melting of Gandhaka present in the pot.
4. White coloured Sulphur fumes were observed at i.e., after 2 & ½ hr of heating. The Sulphur having 114°C as melting point, melts (Sλ) at 169°C, combines with Oxygen forms SO2 and escapes in the form of white fumes.
5. At 165-185°C sulfur starts forming long polymer chains and thus its viscosity increase slightly and it appear with thick yellow fumes.
6. For every half an hour, molten Gandhaka is observed for its colour change according to time and temperature, helps in assessing the Vyoma varna of Gandhaka.

After 9 hours, burning of silk cloth and Vyoma varna of Liquid sulphur was observed along with metallic sound (Potti banged against the pot). Pottali siddha lakshanas were appeared and the Potti was removed from molten sulphur and allowed for self cooling.

After self cooling, Gandhaka which is adhered to the TMGP was scraped out clearly.

### Table 8: Showing the TMGP ingredients

| Ingredients | Quantity          |
|-------------|------------------|
| Tamra bhasma| 10 Karsha (120 gm) |
| Kajali (Shodhit Parada+ Shodhit Gandhaka) | 1 Karsha (12 gm) |
| Shodhit Gandhaka | 1 Tanka (4 gm) |
| Swarna tanutantu khanda | 1 Ratti (750 mg) |

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FIGURES