PHARMACEUTICAL PREPARATION OF HERBO-MINERAL PREPARATIONS W.S.R. TO PANCHAVAKTRA RAS

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KEYWORDS: Khalviya rasayana, Herbo-Mineral Preparations, Panchavakra Ras.

ABSTRACT
The pharmaceutical science is closely related with life science. Knowledge of pharmaceutics is an essential element in medical practice and is the basis for the discovery of new medicines. Before going through preparations of any drug, one has to concentrate on all the matters related to that particular drug like, collection of raw drugs, tests about genuineness of it, different process of prevention and purification, special methods of mixing and so on. Thus pharmaceutical standardization of Ayurvedic medicines is necessary to ensure quality, safety and efficacy of drugs.

Among different preparation of formulations, Khalviya rasayana is a basic procedure applicable to all Rasaoushadis before they are subjected to any specific procedure. It converts crude drugs macro to micro level by trituration and also gives specific Samskara to a drug. Panchavakra Ras is a rational combination of Rasadravyas and Kasthaushadhis. Panchavakra rasa has been taken for its Pharmaceutical standardization through Standard Operative procedures.

The raw drugs Parada, Gandhaka, Tankana are taken and subjected to purification as per Rasatarangini 5/34-35, 8/13-17 and 13/77-78 respectively. Parada, Gandhaka, Tankana, Pippali, Maricha and Krishna Dhattura Swarasas is added in sufficient quantity.

In pharmaceutical study the drug has been prepared in 3 batches adopting Khalviya Rasayana method. The final drug prepared in the pharmacy at the weight of 150 mg. The final product of the drug and all the raw drugs were analyzed before and after the purifications with modern analytical methods viz. XRD, ICP-OES, AAS, SEM with EDX, HPTLC, Physico-Chemical Standards, Pharmaceutical Standards, Preliminary Organic Analysis, and Estimation of Microbial Contamination.

INTRODUCTION

Khalviya rasayana Among the different preparation of formulations, Khalviya method is a basic procedure applicable to all Rasaoushadis before they are subjected to any specific procedure. It is a simple procedure to convert crude drugs i.e. macro to micro level and also gives specific Samskara to a drug.

Mercury is used in the form of Kajjali. It has synergistic action which enhances the properties of other drugs. It acts as catalyst and also it maintains shelf life of medications for longer time. In Khalviya Rasayanas trituration is done, as a result of this it leads to size reduction, increases the surface area and accelerates the therapeutic action by catalytic formation of such colloid which helps in better absorption and easily dispersible. Herbal drugs processed with Kajjali get potentiated, reaches the target tissue accurately (since they are inaccessible alone) and also increases the bioavailability of the drugs.

Panchavakra ras is the one such Khalviya Rasayana and Herbo-mineral formulation. In
Amavata we have come across more than 125 formulations from different texts. It is a strong belief that these formulations have different objectives on the Samprapti vighatana of Amavata.

Panchavakra ras is well known, most commonly used by various Acharyas and studied at various diseases. In the name of Panchavakra ras various formulations are available in Ayurvedic texts. This formula is taken from well known Andhra Telugu book name Basavarajeeyam, 6th chapter (Vata roga nidana lakshana chikitsadhaya) mentioned under Amavata disease.[1]

**Sodhana:** The literal meaning of the term ‘Sodhana’ is purification. It is necessary to explain the exact implication of this term. Otherwise, there is a possibility that it will be misinterpreted to mean making mercury and other metals only physically and chemically pure. Charaka has explained his term as Gunantaradhana. Sodhana is done by many processes like Mardana, Bhavana, Pachana, Prakshalana, Nirvapan, Dhalana etc. with some Vanaspati dravya swarasa and Kashaya.

**Concept of Sodhana:**
- **Sodhana** makes heterogeneous substances into homogeneous form.
- **Sodhana** reduces the hardness of the metals, minerals and makes them suitable for Marana procedure.
- **Sodhana** reduces the particle size and increases the absorption rate.
- **Sodhana** enhances drug property.
- **Sodhana** converts the toxic metals and minerals into non-toxic form. It also eliminates or separates the unwanted toxic things from the drugs.

**Bhavana:** The procedure of steeping the powders of Dhatus and herbs with liquid substances like Swarasa, Kwatha, Taila etc. followed by trituration in Khalvayantra to dryness is known as Bhavana.

**Concept of Bhavana:**
- The **Bhavana** makes the **Bhedana** of drugs and fine particles in size.
- **Bhavana** induces new properties in to the main drugs through various liquids used during the process.
- **Bhavana** enhances original property of drugs
- **Bhavana** also helps in the biochemical action of the drugs and living cells.

**Vati kalpana**

**Vati kalpana**[4] is a pharmaceutical procedure in which the herbal drugs are dried and made in to fine powder separately. In case of minerals they are usually brought into the form of Bhasma or Sindura. Kajjali is made in case of Parada and Gandhaka and other drugs are added with it one by one according to the formula. These are put in to Khalva and triturated together with certain liquid media like Swarasa, Kashaya, simple water, honey etc. And after getting required consistency the Vatis are prepared in desired size and shape.

Even though we find different Vati formulations mentioned in Brihatrayi, the detailed description of Vati kalpana is explained in Sharangadhara samhita, Madyama kanda 7th chapter.

**Purpose of Vati kalpana**

**Accuracy of dosage:** The uniformly mixed ingredient in Vatis is because trituration process will help the patient to receive the intended dose. It is advantageous over the liquid medicines.

**Stability:** usually stability of the drugs in solid dosage form is more than those, which are in liquid form and having potency for long time. Where there is the possibility of a gradual loss of potency, the data of drug and manufacturer should be mentioned on the container. It helps retaining the volatile principles of drugs like Kasturi, Amber, Campor and many herbal aromatic plants.

**Patient acceptance**

**Economy:** Pills are made by mass production method on medicines of high efficiency and output. They also represent a rapid and economical means of dispensing.

**Aim and Objectives**

1. Selection of raw drugs
2. *Shodhana* of raw materials
3. Preparation of *Kajjali*
4. Preparation of fine powder of the ingredients
5. Preparation of *Swarasa* for *Bhavana*
6. Preparation of 3 samples of *Panchavaktra ras*

**Selection of raw drugs**

Drugs are collected from the local market of Vijayawada and thoroughly screened with the help of experts of Rasashastra, Dr.N.R.S.Govt. Ayurvedic College, based on the *Grahy laxanas* mentioned in the classics.

1. **Parada:** Mercury which has bluish tint interiorly, bright exteriorly and appears like the mid-day-sun is considered the best.
2. **Gandhaka:** It should be clean, lusterless and smooth and also looks like a fresh butter (*Navaneeta*). Its color and sting should be similar to that of turmeric (*Rajani prabha*).
3. **Tankan:** *Peethabha* (*Pandu*) in the form of small pieces devoid of taste.
4. **Maricha:** Fruits greyish-black to black, hard, wrinkled, 0.4-0.5 cm in diameter; odour aromatic; tastes pungent.

5. **Pippali:** Fruit greenish-black to black, cylindrical, 2.5 to 5 cm long and consisting of minute sessile fruits, arranged around an axis; taste pungent producing numbness on the tongue; aromatic odour.

### Purification and Processing of raw Drugs

Genuine raw drugs after proper purification/ Shodhana are selected. Many methods of Shodhana are prescribed in our texts, but the method, which is easy, effective and practicable, is used or followed here. When the processing methodology is completed, then the purified drugs are fit for internal administrations.

1. **Parada shodhana** (R.T.5/34-35)
2. **Gandhaka shodhana** (R.T. 8/13-17)
3. **Tankana shodhana** (R.T. 13/77-78)
4. Preparation of Kajjali (R.T. 6/107)
5. Preparation of Pippali churna
6. Preparation of Maricha churna
7. Preparation of Dhatura swarasa
8. Preparation of Panchavaktra ras (Basavarajeeyam, 6th chapter, Vataroga nidana lakshana chikitsadhaya).

#### Practical No. 1

**Parada shodhana**

Table 1: Observations during Parada Sodhana

<table>
<thead>
<tr>
<th>Details</th>
<th>Experiment-1</th>
<th>Experiment-2</th>
<th>Experiment-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of raw Parada taken</td>
<td>250 gms</td>
<td>250 gms</td>
<td>250 gms</td>
</tr>
<tr>
<td>Betel leaves taken</td>
<td>100 gms</td>
<td>100 gms</td>
<td>100 gms</td>
</tr>
<tr>
<td>Nagavalli swarasa</td>
<td>50 ml</td>
<td>50 ml</td>
<td>50 ml</td>
</tr>
<tr>
<td>Ginger taken</td>
<td>100 gms</td>
<td>100 gms</td>
<td>100 gms</td>
</tr>
<tr>
<td>Ardraka swarasa</td>
<td>50 ml</td>
<td>50 ml</td>
<td>50 ml</td>
</tr>
<tr>
<td>Tri-ksara</td>
<td>150 gms</td>
<td>150 gms</td>
<td>150 gms</td>
</tr>
<tr>
<td>pH value this mixture</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Quantity of obtained Shodhita parada</td>
<td>235 gms</td>
<td>230 gms</td>
<td>235 gms</td>
</tr>
<tr>
<td>Difference</td>
<td>15 gms (loss)</td>
<td>20 gms (loss)</td>
<td>15 gms (loss)</td>
</tr>
<tr>
<td>Total duration</td>
<td>24 hrs</td>
<td>24 hrs</td>
<td>24 hrs</td>
</tr>
<tr>
<td>Total expenditure</td>
<td>350 Rs</td>
<td>350 Rs</td>
<td>350 Rs</td>
</tr>
<tr>
<td>Date of commencement</td>
<td>30-10-2006</td>
<td>17-02-2007</td>
<td>14-01-2008</td>
</tr>
<tr>
<td>Date of completion</td>
<td>02-11-2006</td>
<td>20-02-2007</td>
<td>17-01-2008</td>
</tr>
</tbody>
</table>

#### Practical No. 2

**Gandhaka Shodhana**

**Material:**

**Equipment**

Earthen Vessel, Earthen Sharava, Kharal with pestle, Cloth piece, Iron wire, Upalas (cow-dung cakes).

**Procedure**

An earthen vessel with wide mouth is filled with 2 litres of Gokshira and 150 ml of Goghrita and 1/3 is left vacant. The mouth of vessel is covered by means of cloth and tied by iron wire. Gandhaka is powdered (course) and spread upon the cloth. A Sharava is covered on it. The joint being closed with Multanimitti smeared cloth for at least 3 times. It is
allowed to dry in sunlight. After that, the vessel is kept inside a pit (1.5") beneath the surface of soil in such a way as to keep the brim of the vessel on the level of the surface of ground. The empty space around vessel is filled by loose soil. Cow dung cakes are kept on Sharava and set on fire. The Sulphur, after melting by the heat of fire flows down in to the ghee mixed milk vessel through cloth. After Svangasita (self cooling), the vessel is taken out carefully from pit and Sandhibandhan (sealing) is opened. The granules of Gandhaka collected at the bottom of vessel are washed with hot water till Gandhaka gets free from Snigdhata of ghee. After that it is dried under shade, weighed and stored in a clean jar.

The same procedure was followed for another 2 batches.

Precaution
- This procedure is carried out in open space where wind is quiet.
- Ensured that heat is evenly distributed in all sides.
- Less number of Upalas was taken i.e. 30 to avoid over burning of Gandhaka.
- After Sodhana, Gandhaka is washed with hot water to get rid of foul smell.
- The earthen vessel is removed from the pit and the seal is opened carefully.

Observation
- The Sodhita Gandhaka is of shining yellow colour with a greenish tinge. It is found in the form of granules like jawar seeds.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Expt-1</th>
<th>Expt-2</th>
<th>Expt-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial wt. of Gandhaka</td>
<td>500 gms.</td>
<td>500 gms.</td>
<td>500 gms.</td>
</tr>
<tr>
<td>Vol. of Milk</td>
<td>2 litres</td>
<td>2 litres</td>
<td>2 litres</td>
</tr>
<tr>
<td>Wt. of Ghrita</td>
<td>150 gms.</td>
<td>150 gms.</td>
<td>150 gms.</td>
</tr>
<tr>
<td>Final wt. of Gandhaka</td>
<td>480 gms.</td>
<td>485 gms.</td>
<td>485 gms.</td>
</tr>
<tr>
<td>No. of Upalas</td>
<td>30</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Time taken to burn out the Upalas</td>
<td>40 mints</td>
<td>35 mints</td>
<td>35 mints</td>
</tr>
<tr>
<td>Loss of Gandhaka</td>
<td>20 gms.</td>
<td>15 gms.</td>
<td>15 gms.</td>
</tr>
<tr>
<td>Colour of Gandhaka</td>
<td>Yellow granules</td>
<td>Yellow granules</td>
<td>Yellow granules</td>
</tr>
<tr>
<td>Expenditure of the purification</td>
<td>70 rupees</td>
<td>70 rupees</td>
<td>70 rupees</td>
</tr>
<tr>
<td>Temp. of Gandhaka at melted stage</td>
<td>±150ºC</td>
<td>±145ºC</td>
<td>±150ºC</td>
</tr>
<tr>
<td>Date of experiment</td>
<td>3-11-2006</td>
<td>21-02-2007</td>
<td>18-01-2008</td>
</tr>
</tbody>
</table>

Practical No. 3
Tankan Shodhana

Material: Raw Tankan- 250 gms

Equipment:
Sharava, Loha darvi, Gas stove, Khalva yantra

Procedure: 250 gms of raw Tankana is taken in a clean and dry Khalva yantra and pounded well to prepare fine powder. This powder is taken in to a Sharava then it is heated in Mandagni, followed by Tivragni, until all the water content in the Tankana is completely evaporated. Finally Tankana is obtained as a white coloured light substance like “Laja” (puffy, unhydrated Tankana).

Observation:
- During the process the substance turns to liquid form and then again become solid form, bubbles are observed while evaporating water.
- Tankana got puffed up slowly and the hissing sound is noticed.
- During the Bharjana some flakes of Tankana are spilled out from the pan.
- Finally hissing sound is stopped, material becomes coarse, white and light in weight.

Precautions
- Big and wide Sharava to be used to avoid the spilling of Tankana.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Expt-1</th>
<th>Expt-2</th>
<th>Expt-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Tankana</td>
<td>250 gms.</td>
<td>250 gms.</td>
<td>250 gms.</td>
</tr>
<tr>
<td>Purified Tankana</td>
<td>120 gms.</td>
<td>110 gms.</td>
<td>115 gms.</td>
</tr>
<tr>
<td>Loss</td>
<td>130 gms.</td>
<td>140 gms.</td>
<td>135 gms.</td>
</tr>
<tr>
<td>Time taken for purification</td>
<td>2 hours</td>
<td>1 hour 50 mints</td>
<td>1 hour 50 mints</td>
</tr>
<tr>
<td>Date of experiment</td>
<td>03-11-2006</td>
<td>21-02-2007</td>
<td>18-01-2008</td>
</tr>
</tbody>
</table>
Practical No. 4

Preparation of Kajjali: Kajjali is a Sagandha, Niraganti Para yoga. The Bandha involved in this preparation is Kajjali bandha, where Shodhitha Parada and Gandhaka are intimately mixed in definite proportion, to get a black powder called Kajjali. Among all Khalvi Rasayanas Kajjali is having prime importance, as it forms base to many mercurial preparations.

Kajjali is one of chief ingredients in Panchavaktra ras, so Kajjali is prepared first. For this, purified Parada and Gandhaka are taken in 1:1 ratio.

**Ingredients:**
a) Parada b) Gandhaka

**Material:** Khalvayantra

**Method of Preparation**

Purified Parada and Gandhaka were taken in equal quantities in a Khalva yantra and Mardhana is done until the total mixture converted into black powder, very fine like collyrium and the dazzling particles of mercury completely disappeared. After completion of the process, Kajjali was tested to ascertain its suitability for therapeutic purpose.

**Observations**

- After 30 minutes, the color of the mixture started changing from yellowish to grey.
- After 45 mints, 50 percent of mercury disappeared.
- After 3 hours whole mixture turned in to blackish powder but a few shining particles of mercury were observed.
- After 5 hours 30% of shining particles disappeared.
- After 7 hours 50% of shining particles disappeared.
- After 10 hours approximately 70% of shining particles disappeared.
- After 15 hours complete mercury and sulphur turned in to black compound.
- After 18 hours Rekhapurnatva appeared in the Kajjali.
- After 22 hours Nischandratva was observed in the Kajjali, Mercury particles were not seen.

**Table 4: Observations during Kajjali preparation**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Expt-1</th>
<th>Expt-2</th>
<th>Expt-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shodhita Parada</td>
<td>250 gms</td>
<td>250 gms</td>
<td>250 gms</td>
</tr>
<tr>
<td>Shodhita Gandhaka</td>
<td>250 gms</td>
<td>250 gms</td>
<td>250 gms</td>
</tr>
<tr>
<td>Weight of Kajjali</td>
<td>460 gms</td>
<td>470 gms</td>
<td>470 gms</td>
</tr>
<tr>
<td>Loss</td>
<td>40 gms</td>
<td>30 gms</td>
<td>30 gms</td>
</tr>
<tr>
<td>Total duration</td>
<td>26 hrs</td>
<td>28 hrs</td>
<td>26 hrs</td>
</tr>
<tr>
<td>Date of commencement</td>
<td>6-11-2006</td>
<td>23-02-2007</td>
<td>20-01-2008</td>
</tr>
<tr>
<td>Date of completion</td>
<td>12-11-2006</td>
<td>28-02-2007</td>
<td>26-01-2008</td>
</tr>
</tbody>
</table>

**Tests for Kajjali**

- Krishna Varnata (blackish in colour)
- Slakshnatvata (smooth to touch)
- Sukshmata (subtleness)
- Nischandra (lustreless)
- Aswadu (tastelessness)
- Bharavan (heavy)
- Rekhapurnatvata (minuteness)
- According to Yadavji, when Kajjali is rubbed over Swarna or Tamra Patra with lemon juice, appearance of silver like coating shows presence of free Mercury i.e., Kajjali is not fully prepared.
- When Kajjali is made wet, rubbed over palm and when seen under sun light, it should not show any shining particles of Mercury.

**Precautions**

- Mardana should be done slowly to avoid spillage.

**Observations**

- Mardana should be continued till the Kajjali attains specific Lakshanas mentioned above.

**Physical properties of Kajjali**

- Colour: Black
- Smell: Slight sulphurous
- Form: Fine powder
- Touch: Smooth and soft
- Taste: Tasteless
- Appearance: Anjana sadrisha

**Practical No. 5**

**Preparation of Pippali, Maricha Churna**

**Material:**

- Maricha: 250 gms
- Pippali: 250 gms

**Method:** Above mentioned material were taken individually in a Sharava and Barjana was done on mild Agni; then they were powdered in pulveriser with mesh No.100.
Table 5: Observations during herbal ingredients power preparation

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Experiment-1</th>
<th>Experiment-2</th>
<th>Experiment-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pippali</td>
<td>350 gms</td>
<td>250 gms</td>
<td>250 gms</td>
</tr>
<tr>
<td>Maricha</td>
<td>350 gms</td>
<td>250 gms</td>
<td>250 gms</td>
</tr>
<tr>
<td>Obtained Weight of Pippali churna</td>
<td>300 gms</td>
<td>200 gms</td>
<td>200 gms</td>
</tr>
<tr>
<td>Obtain weight of Maricha churna</td>
<td>300 gms</td>
<td>200 gms</td>
<td>200 gms</td>
</tr>
<tr>
<td>Date of experiment</td>
<td>10-11-2006</td>
<td>24-02-2007</td>
<td>23-01-2008</td>
</tr>
</tbody>
</table>

Practical No. 6
Preparation of Dattura swarasa
Material: Fresh Krishna Dattura leaves, knife, mixer.

Procedure: The collected and weighed Dattura leaves are cleaned with fresh water. Then cut in to small pieces and grinded in the mixer until whole mixer became soft. Taken a clean cloth having four angles. Dattura paste is transferred to cloth. All the angles of cloth are folded and squeezed the soft Dattura material. Swarasa is collected in a vessel. The extracted Swarasa was measured and noted.

Pippali powder - 1 part
Maricha powder - 1 part
For Bhavana purpose - Dhatura patra Swarasa- Q.S

Material:
Khalva yantra, mixer, vessel, tray.

Procedure:
- Kajjali, Tankana, Pippali churna, Maricha churna are taken in a Khalva yantra in above-mentioned proportion.
- After formation of homogeneous mixture of all ingredients Dhatura Swarasa is added in sufficient quantity, Mardhana is done carefully for 24 hours.
- When the mass is properly grounded and is in a condition of Matrapaka, the whole mixture is spread on the plastic cover and allowed to dry in the shadow.
- After drying whole material, tablets are prepared with the dose of 150 mg each.

Table 6: Preparation and Observation of Panchavaktra Ras

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Expt-1</th>
<th>Expt-2</th>
<th>Expt-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shodhita Parada</td>
<td>300 gms</td>
<td>250 gms</td>
<td>200 gms</td>
</tr>
<tr>
<td>Shodhita Gandhaka</td>
<td>300 gms</td>
<td>250 gms</td>
<td>200 gms</td>
</tr>
<tr>
<td>ShodhitaTankan</td>
<td>300 gms</td>
<td>250 gms</td>
<td>200 gms</td>
</tr>
<tr>
<td>Pippali powder</td>
<td>300 gms</td>
<td>250 gms</td>
<td>200 gms</td>
</tr>
<tr>
<td>Maricha powder</td>
<td>300 gms</td>
<td>250 gms</td>
<td>200 gms</td>
</tr>
<tr>
<td>Total Qty. of Drug before Bhavana</td>
<td>1500 gms</td>
<td>1250 gms</td>
<td>1000 gms</td>
</tr>
<tr>
<td>Qty. of Dhattura patra Swarasa used for Bhavana</td>
<td>2000 ml</td>
<td>1600 ml</td>
<td>1245 ml</td>
</tr>
<tr>
<td>Total Qty. of drug after Bhavana</td>
<td>2520 gms</td>
<td>2100 gms</td>
<td>1700 gms</td>
</tr>
<tr>
<td>Total Qty. Of drug after drying</td>
<td>1925 gms</td>
<td>1600 gms</td>
<td>1300 gms</td>
</tr>
<tr>
<td>Quantity of Starch added</td>
<td>50 gms (2.6 %)</td>
<td>121 gms (7.6%)</td>
<td>98 gms (7.6%)</td>
</tr>
<tr>
<td>Quantity of binding agents added</td>
<td>192 gms (10%)</td>
<td>64 gms (4 %)</td>
<td>65 gms (5 %)</td>
</tr>
<tr>
<td>Quantity of Lubricants added (magnesium stearate, Talc, Aerosol)</td>
<td>77 gms (4%)</td>
<td>64 gms (4 %)</td>
<td>52 gms(4%)</td>
</tr>
<tr>
<td>Total weight of Drug mass</td>
<td>2245 gms</td>
<td>1849 gms</td>
<td>1515 gms</td>
</tr>
<tr>
<td>Weight of the tablet</td>
<td>150 mg</td>
<td>150 mg</td>
<td>150 mg</td>
</tr>
<tr>
<td>Total no of Tablets</td>
<td>15000</td>
<td>12000</td>
<td>10000</td>
</tr>
<tr>
<td>Date of commencement</td>
<td>13-11-2006</td>
<td>26-02-2007</td>
<td>25-02-2008</td>
</tr>
<tr>
<td>Date of completion</td>
<td>17-11-2006</td>
<td>01-03-2007</td>
<td>31-02-2008</td>
</tr>
</tbody>
</table>
Observations

1. The absorption of Swarasa was very fast by the mixture in the initial stage.
2. During the process of Krishna Dattura swarasa Bhavana to the mixture temperature has shot up to 103° F.
3. During Mardana the whole mixture became sticky and gave a strong odour.

DISCUSSION

Standardization of Panchavaktra Ras (Final product):[13]

A. Physico Chemical Standards
   - Organoleptic Characters
   - Moisture Content
   - Total Ash
   - Acid insoluble ash
   - Alcohol soluble extractive:
   - Estimation of Volatile Matter
   - Analysis of pH
   - Estimation of Moisture by KF

B. Chemical standards of Panchavaktra Ras

C. Pharmaceutical Standards of different samples of Panchavaktra Ras
   - Average weight
   - Hardness
   - Friability
   - Diameter
   - Disintegration Time

D. Preliminary Organic Analysis[14]
   - Content of Alkaloid
   - Content of Saponins
   - Content of Flavonoids
   - Content of Tannins
   - Content of Triterpenoids

E. Solubility Test of Panchavaktra Ras

III. Estimation of Microbial Contamination[15]
   - Bacterial count
   - Moulds & Yeast
   - E.Coli
   - Salmonella spp.
   - Pseudomonas aeruginos
   - S. aureus

IV. Chromatographic Study[16]
   - High Performance Thin Layer Chromatography (HPTLC)

V. X-ray Powder Diffraction
   - XRD Panchavaktra ras[17]
   - XRD Kajjali[18]
   - XRD Tankana[19]

VI. Inductively Coupled Plasma with Optical Emission Spectroscopy (ICP-OES)
   - Panchavaktra Ras[20]

VII. Scanning Electron Microscope Study
   - Kajjali[21]
   - Tankana[22]

VIII. Energy Dispersive X-ray Analysis
   - Kajjali[23]
   - Tankana[24]
   - Panchavaktra Ras

IX. Atomic Absorption Spectrometry
   - Parada[25]

X. Analysis of raw Gandhara and Purified Gandhaka[26]

The loss of the drug after purification in case of Parada is very meagre i.e., 15-20 grm for the 250 gms of raw drug. The purification was done 3 times for 3 batches of Panchavaktra Ras preparation. The comparative study of raw Parada and Parada processed in Sodhana method, both have been subjected to analytical study by Atomic Absorption Spectrometry (AAS). In the same manner Gandhaka sodhana has been taken up as per Rasatarangini 8/13-17 which is considered as very feasible method in terms of quality of purity time and money consumption.

The Kajjali is added in purified Tankan and Pippali, Maricha which are already powdered after Bharjana. The mixture is subjected to Bhavana with Krishna Dattura patra swarasa. Though it is not specially mentioned in text, during the process of Bhavana the temperature in the mixture has shot up to 103° F. The absorption of Swarasa was fast.

The mass of Panchavaktra Ras has been sent for making in to tablets in IMIS Pharmaceuticals each tablet contained 125 mg medicine and 25 mg of starch, binding material etc., Panchvaktra Ras after preparation of mass has been subjected to chemical analysis in the Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) in which about 13 elements have been tried for apart from Mercury and Sulphur. Less than 0.1% of chromium (Cr), 0.001% of Cadmium (Cd), 0.09% of Lead (Pb), 0.02% of Arsenic (As), 0.003% of Copper (Cu), apart from 15% each Mercury, Sulphur, 20- 24% of Boran are detected in the mass. In XRD analytical study also it shows Mercury and Sulphur in bondage.[27]

Tablet was subjected to Physico chemical analysis in which Total ash 24%, acid insoluble ash 1.8%, Alcohol soluble extractive about 7%, Water soluble extractives about 16%, Volatile Matter about 9%, Moisture content about 8.3%, pH value
8.9 and loss on drying 105°C was about 9%. However 125 mg prepared medicine contain 15.5% mercury, 15.55% of Sulphur, and 20% of Boran. The mean difference of the weight of the tablets is less than 5 mg, hardness is 1.15, Friability is 3-4% and Disintegration time was 6-15 mints. Alkaldoids, Saponins, Flavanoids, Tanins, Tritepenoids was 0.25%, 0.18%, 0.3%, 0.6%, 10% respectively. The raw material of Panchavakra Ras was subjected to estimation of microbial contamination which was within normal limits that is 2200 CFU/gr, 3800 CFU, Moulds and Yeast was 10-30 CFU/gr. Total Enterobacteriacea, E.Coli, Salmonella spp., Psedomonas aeruginosa, S. Aureus was totally absent. In 3 samples of Panchavakra Ras the High Performance in Thin Layer Chromatography (HPTLC) study revealed 5 spots almost same Retention factors (Rf) 0.33, 0.49, 0.59. 0.72, 0.99 with slight variation in 5 of these spots in all 3 samples.

CONCLUSION

Pharmaceutical study shows the raw drugs are non controversial. The purification processes followed are also tried time and again. Rasatarangini, 5/34-35 in the case of Parada, Rasatarangini 8/13-17 for Gandhaka and Rasatarangini 13/77-78 for Tankana are considered feasible and hence they can be taken as standard purification methods for concerned drugs. These drugs are subjected to analysis by AAS, chemical analysis which proved to be perfectly pure. The preparation of Kajjali almost took 26 hours to 28 hours of time in which, HgS in the form of Metacinnabar and Orthorhombic structured of free Sulphur available, showing proper combination of Mercury and Sulphur in a perfect manner in the analysis. The presence of 1.5 % of elemental Silver in Kajjali in Energy Dispersive X-ray analysis (EDX) cannot be explained until and unless further series of such analysis is done.

The mixture of Kajjali, purified Tankana, Pippali and Maricha becomes warm when subjected to Bhavana with Dhattura swarasa may be due to activation of Borans in the purified Tankana. The metallic impurities in the purified Parada have reduced to a greater extent confirming the authenticity of the purification process mentioned in relevant text books taken for practical purposes for this study.

As far as Panchavakra Ras is concerned, this showed almost same values for all 3 batches of the medicine indicating for the fixation of standards for this particular compound. Since the instruments used are ICPOES, XRD etc. the values of this analysis can be taken as standard for further practicals in this regard.

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Sodhana Dravya of *Parada*

**Figure 1:** *Parada*

**Figure 2:** *Nagavalli* leafs

**Figure 3:** *Nagavalli* svarasa

**Figure 4:** *Ardraka*

**Figure 5:** *Ardraka* svarasa

**Figure 6:** *Sarja* kshara

**Figure 7:** *Yava* kshara

**Figure 7:** *Tankana* kshara
Parada Shodhana

Impure Parada Pure Parada after Shodhana

Mercury Globules During Mardhana

Mercury Globules During Mardhana
Steps of Purification of Gandhaka

Fig 1. Raw (Impure) Gandhaka
Fig 2. Earthen vessel with Milk and Ghee
Fig 3. Covered by a cloth and tied by iron wire
Fig 4. Spread of Gandhaka over the cloth
Fig 5. Closed and sealed with another vessel
Fig 6. Cow dung cakes with fire
Fig 7. Burned cow dung cakes
Fig 8. After self cooling opened seal
Fig 9. First wash with hot water
Fig 10. Purified Gandhaka
Figure 1: Purification of *Tankana* (Borax)

Preparation of Kajjali
Figure no 4: Preparation of *Panchavaktra ras*
Figure no 5: Contd.... of preparation of Panchavaktra ra