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Research Article

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

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KEYWORDS: *Khalviya rasayana,* Herbo-Mineral Preparations, *Panchavaktra Ras.*

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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.

Panchavaktra Ras is a rational combination of *Rasadravyas* and *Kasthaushadhis*. *Panchavaktra* 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 Swarasa* 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 medicaments 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.

Panchavaktra 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*.

Panchavaktra ras is well known, most commonly used by various Acharyas and studied at various diseases. In the name of *Panchavaktra 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, Nirvapana, Dhalana* etc. with some *Vanaspati dravya swarasa* and *Kashaya*.

Concept of *Sodhana*[2,3]

- *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 *Grahya 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[5]

Materials: 1. *Parada* 2. *Nagavalli Swarasa* 3. *Ardraka Swarasa* 4. *Yava Kshara* 5. *Svarja Kshara* 6. *Tankana Kshara.*

Equipments: *Khalva yantra*, Vessel, Mixer, lukewarm water.

Procedure

- *Parada* is taken with *Nagavalli swarasa*, *Ardraka swarasa* and *Trikshara* in a clean *Khalwa yantra*.
- Doing *Mardana* for eight hours per day for three days makes the mixture.
- Then washed and decanted with the help of lukewarm water for several times to get purified *Parada*.

Observations

- In the process of *Mardana*, the *Parada* in total liquid form is separated and appeared like small shiny pearls.

Precautions

- Utmost care is taken during *Mardana* so as to prevent the spilling of *Parada*.
- Care should be taken during *Mardana*.
- Filtration should be done through two folded cloth piece.
- While squeezing through the cloth, care should be taken that it should not spill.

Table1: Observations during *Parada Sodhana*

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

Practical No. 2

Gandhaka Shodhana[6]

Material:

1. *Gandhaka* 2. *Goghrita* 3. *Gokshira*

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 2: Observations during *Gandhaka Sodhana* process

Parameters	Expt-1	Expt-2	Expt-3
Initial wt. of *Gandhaka*	500 gms.	500 gms.	500 gms.
Vol. of Milk	2 litres	2 litres	2 litres
Wt. of *Ghrita*	150 gms.	150 gms.	150 gms.
Final wt. of *Gandhaka*	480 gms.	485 gms.	485 gms.
No. of *Upalas*	30	25	25
Time taken to burn out the *Upalas*	40 mints	35 mints	35 mints
Loss of *Gandhaka*	20 gms.	15 gms.	15 gms.
Colour of *Gandhaka*	Yellow granules	Yellow granules	Yellow granules
Expenditure of the purification	70 rupees	70 rupees	70 rupees
Temp. of *Gandhaka* at melted stage	±150^{0}C	±145^{0}C	±150^{0}C
Date of experiment	3-11-2006	21-02-2007	18 -01-2008

Practical No. 3

Tankan *Shodhana*[7]

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 *Khalwa 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 3: Observations during Tankana Sodhana process

Parameters	Expt-1	Expt-2	Expt-3
Raw Tankana	250 gms	250 gms	250 gms
Purified Tankana	120 gms	110 gms	115 gms
Loss	130 gms	140 gms	135 gms
Time taken for purification	2 hours	1 hour 50 mints	1 hour 50 mints
Date of experiment	03-11-2006	21-02-2007	18-01-2008

Practical No. 4

Preparation of *Kajjali*:[8] *Kajjali* is a *Sagandha*, *Niragni Parada 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

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

Tests for *Kajjali*[9]

- *Krishna Varnata* (blackish in colour)
- *Slakshnatva* (smooth to touch)
- *Sukshmata* (subtleness)
- *Nischandra* (lustreless)
- *Aswadu* (tastelessness)
- *Bharavan* (heavy)
- *Rekhapurnatva* (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. [10]
- When *Kajjali* is made wet, rubbed over palm and when seen under sun light, it should not show any shining particles of Mercury[11]

Precautions

- *Mardana* should be done slowly to avoid spillage.
- *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

Parameters	Experiment-1	Experiment-2	Experiment-3
Pippali	350 gms	250 gms	250 gms
Maricha	350 gms	250 gms	250 grms
Obtained Weight of *Pippali churna*	300 gms	200 gms	200 gms
Obtain weight of *Maricha churna*	300 gms	200 gms	200 gms
Date of experiment	10-11-2006	24-02-2007	23-01-2008

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.

Fresh Krishna *Datura* leaves- 2 kg

Swarasa obtained - 1200 ml

Practical No. 7

Preparation of *Panchavaktra Ras*[12]

Ingredients:

Shodhita Parada - 1 part

Shodhita Gandhaka - 1 part

ShodhitaTankan - 1 part

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 *Dhattura 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*

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

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 103^0 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.
- ❖ Pseduomonas aeruginos
- ❖ S. aureus

IV. Chromatographic Study[16]

High Performance Thin Layer Chromatography (HPTLC)

V. X-ray Powder Diffraction

XRD *Panchavaktraras*[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 *Dhattura patra swarasa*. Though it is not specially mentioned in text, during the process of *Bhavana* the temperature in the mixture has shot up to 103^0 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 105^0 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. Alkaloids, Saponins, Flavanoids, Tanins, Tritepenoids was 0.25%, 0.18%, 0.3%, 0.6%, 10% respectively. The raw material of *Panchavaktra 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 *Panchavaktra Ras* the High Performance in Thin Layer Chromatography (HPTLC) study revealed 5 spots almost same Retention factors (R_f) 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 *Panchavaktra 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.

REFERENCES

1. Basavarajeeyam, by Basava Raju, edited by Puvvada Suryanarayana, ABS Publishers, Rajahmundry, 1998 (Telugu); p.309.
2. Rasa Tarangini by Pranacharya Sri Sadananda Sharma edited by Pandita Kashinath Shastry published by Motilal Banarasidas, New Delhi. Reprint: 2004; Page no: 22.
3. Bandari Srinivasulu, P Bhadra Dev, PHC Murthy. A concept of Sodhana (Purification) w.s.r. to Parada (Mercury) International Journal of Ayurvedic Medicine, 2011, 2(3), 119-12.
4. Sharangadhara, Sharangadhara Samhita, Choukhambha Surbharti Prakashan, Varanasi, Reprint 2013, Madyama kanda 7 th chapter.
5. Rasa Tarangini by Pranacharya Sri Sadananda Sharma edited by Pandita Kashinath Shastry published by Motilal Banarasidas, New Delhi. Reprint: 2004; p.22.
6. Ibid p.177-178.
7. Ibid p. 318-319.
8. Rasa Tarangini by Pranacharya Sri Sadananda Sharma edited by Pandita Kashinath Shastry published by Motilal Banarasidas, New Delhi. Reprint: 2004; p. 124-125.
9. Rasamritam by Yadavji Trikamji Acharya translated Dr. Damodar Joshi and Dr. G. Prabhakar Rao. Chaukambha Sanskrit Bhavan, Varanasi, 1st Edn, 1998. Rasamrit 1/8.
10. Rasamritam by Yadavji Trikamji Acharya translated Dr.Damodar Joshi and Dr.G. Prabhakar Rao. Chaukambha Sanskrit Bhavan, Varanasi, 1st Edn, 1998. Rasamrit remarks 1/8.
11. Tarangini by Pranacharya Sri Sadananda Sharma edited by Pandita Kashinath Shastry published by Motilal Banarasidas, New Delhi. Reprint: 2004; pp.126.
12. Basavarajeeyam, by Basava Raju, edited by Puvvada Suryanarayana, ABS Publsihers, Rajahmundry, 1998 (Telugu); Basavarajeeyam, Vataroga nidana lakshana chikitsadhaya, 6 th chapter.
13. Bandari Srinivasulu, P Bhadra Dev, PHC Murthy. Physico-chemical Analysis of Panchavaktra Ras: A Herbo-mineral Formulation. Int.Res.J.Pharm 2013;4(3):104-109.
14. Ibid.
15. Ibid.
16. Srinivasulu Bandari, Bhadra Dev P, Murthy PHC. HPTLC Fingerprinting in the Standardization of Panchavaktra Ras: A Herbo-Mineral

Preparation. International Journal of Ayurvedic Medicine, 2011, 2(4), 192-198.
17. Bandari Srinivasulu, P Bhadra Dev, PHC Murthy Physico-chemical Analysis of Panchavaktra Ras: A Herbo-mineral Formulation. Int.Res.J.Pharm 2013;4(3):104-109.
18. Bandari Srinivasulu, P Bhadra Dev, PHC Murthy. X-Ray Diffraction Analysis of Samaguna Balijarita Kajjali (Black Sulphide of Mercury). IJRAP 3(4), Jul-Aug 2012; 524-527.
19. Srinivasulu B, Bhadra Dev P, Murthy PHC. Physico-Chemical Standardization of Tankana (Borax): An Ayurvedic Mineral Drug. The Pharma Innovation Vol. 1 No. 6 2012; 18-25.
20. Bandari Srinivasulu, P Bhadra Dev, PHC Murthy. Physico-chemical Analysis of Panchavaktra Ras: A Herbo-mineral Formulation. Int.Res.J.Pharm 2013;4(3):104-109.
21. Bandari Srinivasulu, P Bhadra Dev, PHC Murthy. Chemical Characterization of Samaguna Balijarita Kajjali (Black Sulphide of Mercury). Int.J.Pharm.Phytopharmacol.Res. 2012, 2(1): 16-19
22. Srinivasulu B, P Bhadra Dev, PHC Murthy. Physico-Chemical Standardization of Tankana (Borax): An Ayurvedic Mineral Drug. The Pharma Innovation Vol. 1 No. 6 2012; 18-25.
23. Bandari Srinivasulu, P Bhadra Dev, PHC Murthy. Chemical Characterization of Samaguna Balijarita Kajjali (Black Sulphide of Mercury). Int.J.Pharm.Phytopharmacol.Res. 2012, 2(1): 16-19.
24. Srinivasulu B, P Bhadra Dev, PHC Murthy Physico-Chemical Standardization of Tankana (Borax): An Ayurvedic Mineral Drug. The Pharma Innovation Vol. 1 No. 6 2012; 18-25.
25. Bandari Srinivasulu, P Bhadra Dev, PHC Murthy A concept of Sodhana (Purification) w.s.r. to Parada (Mercury) International Journal of Ayurvedic Medicine, 2011, 2(3), 119-12.
26. Bandari Srinivasulu, P Bhadra Dev, PHC Murthy. Sodhana of Gandhaka (Sulphur) with Godugdha (Cow's Milk), Gogrutha (Cow's Ghee): A Chemical Analysis. JPSI 2(1), Jan-feb 2013, 70-72.
27. Bandari Srinivasulu, P. Bhadra Dev, P.H.C.Murthy. Physico-chemical Analysis of Panchavaktra Ras: A Herbo-mineral Formulation. Int.Res.J.Pharm 2013;4(3):104-109.

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Sodhana Dravya of *Parada*

Figure 1: *Parada*

Figure 2: *Nagavalli* leafs

Figure 3: *Nagavalli svarasa*

Figure 4: *Ardraka*

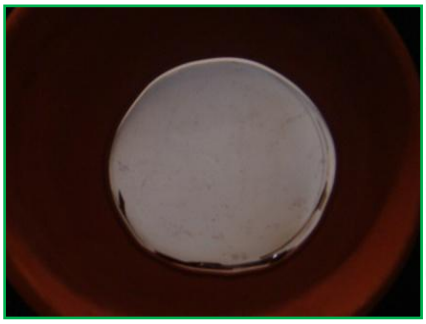
Figure 5: *Ardraka svarasa*

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