Concept of Kupipakwa Rasayana and its Standardization

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Contents:-

- Introduction
- Definition & history of Kupipakwa
- Various types of Kupipakwa
- Method of preparation, Precautions
- Physico chemical evaluation of Kupipakwa
- Toxicity study of Kupipakwa
- Efficacy evaluation of Kupipakwa

Kupi Pakwa Rasayana

Introduction:-

- In the development stream of *Ayurvedic* medicine Rasaushadhis were introduced during medieval period.
- Among them Parada occupied an important place in respect of its therapeutic importance. There is a group of mercurial products where Parada is a base material.
- Apart from the Parada many other minerals were also identified for therapeutic purposes and a large number of Rasaushadhis have come up.
- With some specific qualities like small dose, quik effectiveness, effective in chronic disease, easy in transportation and long self life made Rasaushadhis them superior over the conventional *Ayurvedic* medicine.

- Gandhaka Jarana inducess different disease curing capacity.
- Jarana of Swarna and Abhraka inducess *Rasayana* property in parada.

- To convert the Parada into medicine Murchchhana is essential. Jarana process makes Parada Murchchhita.

- When the jarana process is performed through kupi, Rasa Sindoora, Rasa Karpura like preperations come up.

- Here Kupi is used as Yantra for Gandhaka Jarana. Therefore we can say that Kupipakwas are the out come of Jarana process.

- Parada is a chief material of Rasa Shastra. The whole development of Rasa Shastra based on the nucleus of Parada. ("*Rasoprasa rajatwat rasendra iti kirtitah*").

- Among all the earth materials parada is considered as an essence of earth. Parada can consumes all the material of the earth specially metals.

- With this it becomes potent for therapeutic as well as alchemic purposes. To make parada potent and free from impurities many fold specialized treatment like Shodhana, Samskara, Jarana, Murchchhana etc.

- Its 1st to 5th Samskara of Parada looses impurities and from 6th to 18th it became potent for therapeutic and alchemical purposes. Murchchhana process converts Parada into medicine.

Definition of Kupipakwa

"Kupi iti kacha kupi",

"Pakwam agninam pakwam",

"Rasasya Paradasya Ayanam sthapanam"

"Arthat Kupyam agninam pakwam yad rasayanam tat kupipakwa rasayanam''

It is prepared by keeping Parada,Gandhaka etc. material in a Kach Kupi (glass bottle) and subjecting to heating and Rasayanas prepared through this are known as Kupi Pakwa Rasayana.

Shuddha Parada / Asta Samskarita Parada is triturated with Shuddha Gandhaka to form Kajjali. This Kajjali is subjected to *Bhavana* with advocated herbal juices.

Parada, Lavana, Kshara, Kasisa, Sphatika, Tuttha etc. drugs are made into shining less powder, filled in a glass bottle and subjected to mild, moderate and severe heat in Antardhooma / Bahirdhoom method. This is known as Kupi Pakwa kalpa.

Depending upon the materials and method of heating it is of different colours like red (Rasa Sindoora), white (Rasa Karpura) etc.

Types of Kupi Pakwa

It is of two types: 1. Sagandha 2. Nirgandha.

Sagandha:-

Parada + Gandhaka = Rasa Sindoora

Parada + Gandhaka + Tamra = Tamra Sindoora

Parada + Gandhaka + Non metal = Malla Sindoora, Tala Sindoora, Shila Sindoora etc.

Parada + Gandhaka + non metal +Swarna = Poorna Chandrodaya, Tala Chandrodaya etc.

Nirgandha:-

Rasa Pushpa, Rasa Karpura etc.

Types according to the site of collection of product:

The product collected at the neck or base of the bottle or from both. Based on this, Kupipakwa is of three types i.e.

Kanthastha : Rasa sindoora , Rasa Karpura ,Malla Sindoora
Talastha : Sameerapannaga Rasa, Rasa Sindoora
Ubhayastha : Poorna Chandrodaya Rasa, Manikya Rasa.

Types based on the method of preparation

Antardhuma method = Talastha
Bahirdhuma method = Kantastha

History of Kupi Pakwa Rasa

Rasa Sindoora was first mentioned by Sri Yasodhara bhatt of 12th century in his book Rasa Prakasha Sudhakara by the name of Udaya Bhaskara Rasa and Rasa Karpura has been mentioned by the name of Ghanasara rasa. Its method of preparation, properties and indications are also described.

Kupi and Sikata yantra was used to prepare Udaya Bhaskara rasa.

Ananta deva Suri of 15th century has described Kupipakwa in Rasa Chintamani by the name of Rasa Parthiva Rasa.

Further it mentioned in Rasa Kaumudi of 16 th century and Ayurveda Prakasha of 17th century by the name of Sindoora rasa.

In Rasa Tarangini various types of Rasa Sindoora have been mentioned. Rasa Sindoora is an out come of Gandhaka Jarana process. Shadguna balijarana has done to induce disease curing capacity in Parada. In this jarana , definite quantity of Parada and Gandhaka (6 parts Parada and 1 part Gandhaka) and specific amount of heat is given to form a compound similar to Sindoora.

Gandhaka Jarana has been first described in Rasa Hridaya Tantra (10th century A.D). Later it was developed in the form of Kupipakwa preparation. (Kupipakwa is an advancement of Gandhaka Jarana process).

Method of preparation of Kupi Pakwa Rasa

Procedure:

Chief ingredients: Shuddha / Asta samskarita Parada, Shuddha Gandhaka, Swarna etc.

The Kajjali of Shuddha Parada and Shuddha gandhaka is first prepared. Kajjali can be prepared by taking mercury and sulphur in different ratios.

In Rasa Tarangini, ardha guna, sama guna,dwiguna, tri guna and shad guna Kajjali have been mentioned for the preparation of Rasa Sindoora. Apart from these, the examples of Kajjali prepared with 1/6th ,1/4th , 1 ¼ (sapada samaguna) , 1 ½ (saardha sama guna) or 4 times of sulphur have been mentioned.

After the preparation of Kajjali, addition of other materials like Navasadara is also in practice.

Bhavana of *Kajjali*

- *Kajjali* is triturated with the juices of *Vatankura*, *Ghrita Kumari*, *Rakta Karpasa pushpa*, *Nimbu swarasa* etc. before subjecting it for heating.
- Any of the above drugs may be taken as mentioned for *Bhavana* of *Kajjali*.

Equipments

The following equipment's are essential for the preparation of Kupipakwa rasa.

- Kacha Kupi
- Cloth
- Kupi stand
- Multani mitti
- Baluka yantra
- Baluka (sand)
- Lauha shalaka
- Furnace (EMF)

Preparation of Kacha Kupi

- Bear bottles are convenient for the preparation of Kupipakwa Rasa. They are placed inverted on the Kupi stand. Long cloth pieces (sufficiently long to cover the whole bottle) are taken. One cloth is smeared with Multani Mitti and covered over the glass bottle. After it dries another layer of cloth is put. In this way 7 layers of cloth and Multani Mitti are covered.
- Baluka yantra can also be covered with cloth and mud for protection.
- **Baluka Yantra**

  Baluka Yantra contains following material:

  1.Flower-pot

  2. Baluka

  3. Kacha kupi,Size of the flower-pot should be equal to the size of kacha kupi. Baluka (sand) should be of medium type.

Lauha Shalaka

- During heating the neck of the bottle is obstructed by the Gandhaka, Navasadara etc. To remove this obstruction a hot iron rod (Tapta lauha shalaka) is used. Shalaka is heated and inserted into the mouth of the bottle to clean the obstruction. By this Gandhaka gets burnt and the obstruction of neck is cleared. For this purpose 3 to 4 feet long iron rod should be taken.
- **Mode of heating**
- **Mode / intensity of heating depends upon the Preparation**

  For the preparation of Rasa Sindoora Mridu (mild), Madhya (moderate) and Teevra heat is applied.

  For Rasa Karpura and Swarna Vanga Mridu and Madhya temperature is require.

Mudra and Mudrana of Kupi Mukha

- The sealing of the mouth of kacha kupi is known as Mudrikarana / Mukha mudrana . The cork used for sealing the bottle mouth is known as Mudra. A cork which fits into the mouth of the bottle is used for corking.

- Madana Mudra / Hatha Mudra words are also used in practice for corking. Only Multani Mitti and cloth may also be used for this purpose.

The following points should be considered before corking

- Flame should be stopped completely.
- The base of the bottle should appeared red.
- When white shining particles of mercury rising up are observed in the bottle when seen with the torch light.
- If cold iron rod is inserted in to the bottle fumes should not come out of it.
- When a copper coin is placed over the mouth of kupi, particles of mercury get sticked to it and that portion appears whitish.
- When hot iron rod is inserted into the bottle nothing gets sticked to it.
- When the above findings are observed the mouth of the kupi should be sealed.

Method of Breaking Kupi

After self cooling kupi is removed out of the furnace. The layers of Kapada mitti (cloth and clay) are removed carefully by scraping with a knife. When the kupi is cleaned externally, the site of the deposition of the sublimated compound can be assessed easily. A thread socked in kerosene is tied around the bottle 1 inch below the level of deposition of the sublimated compound and ignited. After complete burning the bottle should be covered with a wet cloth.

The wet cloth is removed when cracking sound heard. The upper portion of the bottle (neck) is taken out carefully. The drug adhered portion of the bottle is hammered from all side with a small wooden hammer. Care should be taken to see that the bottle does not break. On hammering the sublimated product of Rasa sindoora gets separated from the neck of the bottle. It is collected carefully. Care should be taken to see that glass particles do not mix with the product.

Rasa Sindoora (Red Sulphide of Mercury) (Rasa Yoga Sagara – Rasayana)

Shudhha Parada+ Shuddha Gandhaka (1 pala each)

↓

preparation of kajjali

↓

Bhavana with *vatankura swarasa* for three times

↓

Filled in kupi covered with seven layers of cloth

Two angula of sand is placed in Baluka Yantra. The Kupi is kept in it and covered with sand from all sides. Baluka Yantra is then placed on a furnace and heated in mild, moderate and severe.

When the sulphur gets burned completely (flame completely stops) the mouth of Kupi is sealed with jaggery and lime. Further intense heat is given. After self cooling the bottle is taken out of the Baluka yantra and broken. Bright red coloured (like red lotus) compound of Rasa Sindoora is obtained from the neck of the bottle.

Quantity of Rasa Sindoora Obtained

Six part of mercury and one part of sulphur combine to produce Rasa Sinduoora. If 100 gms of mercury and 100 gms of sulphur are taken then 116 gm. of Rasa Sindoora will be obtained. But there will be some loss during preparation and if prepared properly 110 gm. of Rasa Sindoora can be obtained.

Dose of Kupipakwa:-

Rasa Sindoora : 1-2 Ratti, 2 times /day.

Rasa Karpura : 1/64 -1/32 Ratti, 2 time/day.

Anupana : Honey, ghee, butter etc.

Properties and Indications of Rasa Sindoora

It has best Rasayana and Vajeekarana properties.

It strengthens the ligaments and is a best nervine tonic. It enhances the vital capacity of lungs.

It pacifies five types of vayu and is useful in Jwara(fever), Prameha (urinary disorders), Shoola (pain), Bhagandhara (fistula in ano), Kshaya,Gulma,Pandu (anaemia), Vrana (ulcer), Sthaulya (obesity), Agnimandhya (dyspepsia) and Kustha (skin diseases).

It produces a feeling of well being and maintains health. It sends out the vitiated pitta but does not produce diarrhoea or gastric irritation. It is a best yogavahi (catalyst) drug.

Makaradhwaja

Ingredients :

Kantaka vedhi Swarna patra - 1 part

Hingulottha / Asta samskarita Parada - 8 parts

Shuddha Gandhaka - 16 parts

Drugs used for *Bhavana* :

Swarasa of Rakta Karpasa puspha / Vatankura / Ghrita Kumari swarasa according to requirement.

Siddha Makaradhwaja

Ingredients:

Shodhita Swarna patra	– 4 parts
Hingulottha / Asta Samskarita / Shadaguna jarita Parada	– 8 parts
Shuddha Gandhaka	– 16 parts

Procedure

Kantaka vedhi Swarna patra are cut into small pieces and taken in a Khalva yantra.

Parada is added to it and triturated till the Swarna gets dissolved completely / dispersed in Parada.

Gandhaka is then added and triturated properly to form a Kajjali. Kajjali is then subjected to *Bhavana* with *Rakta Karpasa puspha swarasa / Vatankura swarasa / Ghrita Kumari swarasa.*

The bhavita Kajjali is filled in a glass bottle covered with 7 layers of cloth and mud, put in Baluka Yantra and heated in mild , moderate and severe.

The mode of application of heat is similar to Rasa Sindoora. After self cooling the bottle is broken.Makaradhwaja is collected from the neck of the bottle and powder of Swarna is obtained at the base of the bottle . Makaradhwaja is also known as Chandrodaya / Swarna Sindoora.

The powder of Swarna is mixed with Makaradhwaja,triturated properly for three days in Khalva Yantra and used for therapeutic purposes with proper vehicle.

1 part of powder of Swarna (obtained at the base of the bottle), 8 parts of Makaradhwaja, 4parts each of Lavanga, Jatiphala and Keshara (saphron) are taken and triturated with the juice of betel leaf properly . 1 tola of camphor and 1 tola of Kasturi are added and again triturated . Tablets of 2 Ratti are prepared, dried and preserved in glass bottles.

- **Dose** : ½ to 2 Ratti (1- 2 tablets) with boiled and cooled milk mixed with sugar candy, twice a day.
- **Anupana** : Butter,honey
- **Properties and indications**:

  It improves metabolic fire(Jatharagni vardhaka), memory power, longevity and lustre of the body. It prevents aging and cures all kinds of diseases when used with different vehicles.

Siddha Makaradhwaja

(Bhaishajya Ratnawali)

Ingredients:

- Swarana patra – 1 part
- Hingulottha parada - 2 parts
- Shuddha Gandhaka - 4 parts
- **Drugs used for *Bhavana*** – *Rakta Karpasa puspa, Sweta Ankota phala rasa* and *Ghrita kumari swarasa*. (One *Bhavana* with each).
- **Procedure**: Like Makaradhwaja.
- **Dose**: ½ to 2 Ratti
- **Anupana**: Honey, Butter, Juice of Tulasi leaves, Ardraka etc.

- **Indications**:

  It is useful in Kshaya, Kasa (Cough), Prameha, Antra shotha (Enteritis), Sannipataja Jwara (chronic fever), Mandagni (dyspepsia), Aruchi (anorexia),Kati shoola (lumbago), Hritshoola (Angina), Parinama shoola (peptic ulcer), Shwasa (Dyspnoea), Kushtha (skin diseases), Galaganda (goiter), Gandamala (cervical lymphadenitis), Antra vriddhi (hernia), Atisara (diarrhoea), Chronic Shleepada (filariasis), Nadi Vrana (sinus), Arsha (piles), Bhagandara (fistula in ano), Dhwaja Bhanga (erectile dysfunction) etc.

Rasa Pushpa

(Sub chloride of mercury)

- **Ingredients:**

Shuddha Parada	–	1 part
Saindhava Lavana	–	1 part
Shuddha Kasisa	-	1 part

Procedure: All the above drugs are taken in a khalva Yantra, triturated properly and filled in a glass bottle covered with 7 layers of cloth and mud. It is heated in Baluka Yantra method for 6 hours in mild and moderate manner. When the fumes stop evolving, mouth of the bottle is sealed. The send covering the neck of the bottle (up to 2 “) is removed to make it cool and facilitate the sublimation of compound.

Pariksha (Test of Rasa pushpa): A bright shining iron plate is taken and a drop of water is placed on it. A small piece of Rasa Pushpa is put over the drop. After some time the water is thrown away. If a black mark is not found at the site of water drop, it infers that Rasa Pushpa is devoid of salt contents.

- **Dose**: ½ to 2 ½ Ratti.
- For purgation 2 ½ Ratti is given . For treating Hikka (hiccough) 1/8 Ratti is given . For treating Phiranga (syphilis) ¼ Ratti is given.
- **Anupana :** Jaggery, butter,milk etc.

Rasa Karpura

(Per chloride of Mercury)

- **Ingredients :**

- Shuddha Parada - 1 part
- Gandhakamla (Sulphuric acid) - 1 ½ part
- Saindhava Lavana - 1 part

Properties and Indications

- It endicates all types of micro organisms. It pacifies twak and rakta dosha . It prevents discharge from the ulcer. It improves appetite and has Grahi (absorbent) property. It is useful in diarrhoea , dysentary, anorexia and worm infestation . In large dosage it produces toxic effects of mercury. It is useful in blisters , skin diseases, itching,infective syphilis and painful ulcers. In low dosage it is a digestive. It is soluble in 16 times of water.
- In therapeutic dosage it cures early morning diarrhoea and diarrhoea after meals. It eradicates chronic loose, burning stool and stool mixed with kapha and rakta (pravahika)

- **Dose** : 1/64 to 1/32 Ratti (2 – 4 mg)

- 5 Ratti of Shuddha Navasadara, 5 Ratti of Rasa Karpura are mixed together and dissolved in 750 ml of cold water . 30 to 60 drops of this solution is used for therapeutic purposes.

- 5 Masha (gm) of Twak powder , 1 Ratti of Rasa Karpura (triturated with lemon juice) are taken and mixed properly . 1 Ratti tablets of this mixture are made and used.

Rasa Sevana Vidhi

After cleaning the body by Panchakarma the Rasa yogas are used with proper vehicle15,30 days. Parada Bhasma is taken with a betel leaf.

Pathya : Ghrita, Dugdha, Dadhi, Saindhava lavana, Dhaniya, Jeeraka,Chaulai, Paravala,Lauki, Shali rice, Hansodaka, Mudga Yusha.

Apathya : Bilwa, Brihati, Kushmanda,Vetankura, Karavellaka, Masha, Masura, Nishpava, Kulattha, Sarshapa taila , langhana, udvartana,snana(bath), chicken, alcohol,kanji, asava,anupa mansa, eating in bronze vessel or banana leaf, guru, vistambha, ushna and teekshna diet are considered non congenial during Parada therapy.

Treatment of toxic effects of Parada

- During the intake of Parada bhasma or compounds of Parada if a person gets severe nausea, Jeeraka powder with curd / rice /black fish should be given.
- If any pain occurs in the body due to the aggravation of vata, Narayana taila like vata pacifying drugs should be given for external application. If irritability or sleeplessness occurs, cold water should be sprinkled over the body. If intense thirst is developed, coconut water with sugar or mudga yusha should be given.
- Brihati & Bilwa fruits should be taken after stopping the use of Parada bhasma and compounds of Parada. After that the patient need not follow any dietic or behavioral restriction.

Scientific Studies conducted in the dept. on Kupi pakwas

Following drugs from kupi pakwa group have been studied for its toxicity on biochemical and histopathological levels, such as

1. Study on Swarana Vanga — Dr. Gyaneswara Sharma
2. Study on Rasa Karpura — Dr. Prabhakar Rao
3. Effect of Shadaguna bali Jarana on Parada — Dr. Anil singh
4. Makaradhwaja — Dr. P. K. Prajapati
5. Study on Malla Sindoora — Dr. Ravi Prakash
6. Comparative study of Rasa Sindoora and Hingula — Dr. Ramsagar
7. Study of Swarna Vanga — Dr. R.P.Sharma

Toxicity study

1. Makaradhwaja- (Sri durga *et all* 2000)

Toxicity study was carried out on albino rats and rabbits in three level i.e. acute, sub-acute and chronic with different doses of the treated drug (4mg, 8mg and 12mg per 100gm of animal) and changes were observed in histopathological and biochemical parameters. In chronic study on higher doses 2/5 cloudy swelling of kidney, 1/5 mild congestion of the lungs were observed which was non significant in comparison to control group. In biochemical study all the parameters were found changed but changes were non significant in comparison to control group.

2. Malla Sindoora- H .L. Sawhney. *et all* 1973

Toxicity study was carried out on albino rats in two level i.e acute and chronic in different dose of the treated drug (0.15mg, 0.20mg and 0.25mg per 100gm) and changes were observed in histopathological parameters. In chronic study on higher doses 2/5 focal fatty changes in liver, 1/5 congestion in spleen, 2/5 cloudy swelling of kidney, were observed which was non significant in comparison to control group.

3. Swarna vanga -Dr. Gyaneswar Sharma *et all* 1983

Toxicity study was carried out on albino rats in two level i.e acute and chronic in different dose of the treated drug (12mg, 25mg, 50mg and 100 mg per 100gm) and changes were observed in histopathological parameters. In chronic study on higher doses 1/5 fatty changes in liver, 1/6 congestion in spleen, 1/6 cloudy swelling of kidney and 2/6 peribronchial hypertrophy of lungs were observed which was non significant in comparison to control group. In chronic study on higher doses 1/5 fatty changes in liver, 1/6 congestion in spleen, 1/6 cloudy swelling of kidney and 2/6 peribronchial hypertrophy of lungs were observed which was non significant in comparison to control group

4.Samirapannaga Rasa – Ravi Prakash *et all* 1995

Toxicity study was carried out on albino rats in two level i.e sub-acute and chronic in different dose of the treated drug (2mg, 4mg, 6mg and 8 mg per 100gm of animal) and changes were observed in histopathological parameters. In sub acute study on higher doses 2/5 focal fatty changes in liver, 1/5 congestion in spleen, 2/5 cloudy swelling of kidney, were observed which was non significant in comparison to control group. In chronic study on higher doses 2/5 fatty changes in liver and necrosis, 1/5 congestion in spleen, 4/5 cloudy swelling of kidney and 2/5 peribronchial hypertrophy of lungs were observed.

Analytical study

1. Makaradhwaja- (Prajapati *et all* 1993)

Chemical studies-

i.) Qualitative – Hg, Fe and S are present

ii.) Quantitative – Hg - 82.2%, Total sulphur -16.36%, Free sulphur - 2.86

2. Malla Sindoora- (H .L. Sawhney. *et all* 1973)

- Hg- 68.6679%,
- As- 9.65%,
- S- 18.72

3. Swarna vanga- (G Sharma *et all* 1983)

- **Sn** - 46.41%, 53.25%, 58.82%, 61.56%,
- **Hg** - 1.03%, 0.81%, 0.63%, no estimable
- **S** - 28.28%, 24.50%, 27.29%, 25.97%.
- **Free Sulphur** -10.88%, 8.24%, 7.98%, 7.52%

4.Sameerpannaga rasa– (Ravi Prakash *et all* 1995)

- **Hg** - 16%,
- **As** - 57.30%,
- **Free Sulphur -** 2.6%

Efficacy Study of Makaradhwaja

Efficacy on immunological parameter inhealthy individuals (15)

- The mean value of IgG in healthy individuals before treatment was 158.33 ± 66.85, IgA was 193.33±33.39 and IgM was 127.66± 24.80 and the mean value after treatment 175.00±45.22, 203.33±46.58 and 128.33±33.52 respectively. There was no significant change in these values after treatment.
- The mean value of serum creatinine before treatment was 00.89± 00.19 and serum creatinine after treatment was 00.69± 00.15 there was decrease in mean values of serum creatinine after treatment which was found to be statistically highly significant.

1. **Efficacy on immunological parameters in Chronic Renal Failure individuals (15)**

   The mean value of IgG, IgM and IgA in Chronic Renal Failure individuals before treatment was 900.00 ± 105.40, 103.00±18.88, 259.00±86.98 and the mean value after treatment 995.00±106.58, 113.00±33.34, 277.00±90.43. There was highly significant change in the values of IgG after treatment.

2. **Efficacy on urinary protein (mg/dl) parameters in Chronic Renal Failure individuals (15)**

   The mean value of urinary protein (mg/dl) before treatment was 120.75±77 and after treatment was 89.25±75.32. There was decrease in urinary protein (mg/dl) which is statistically highly significant.

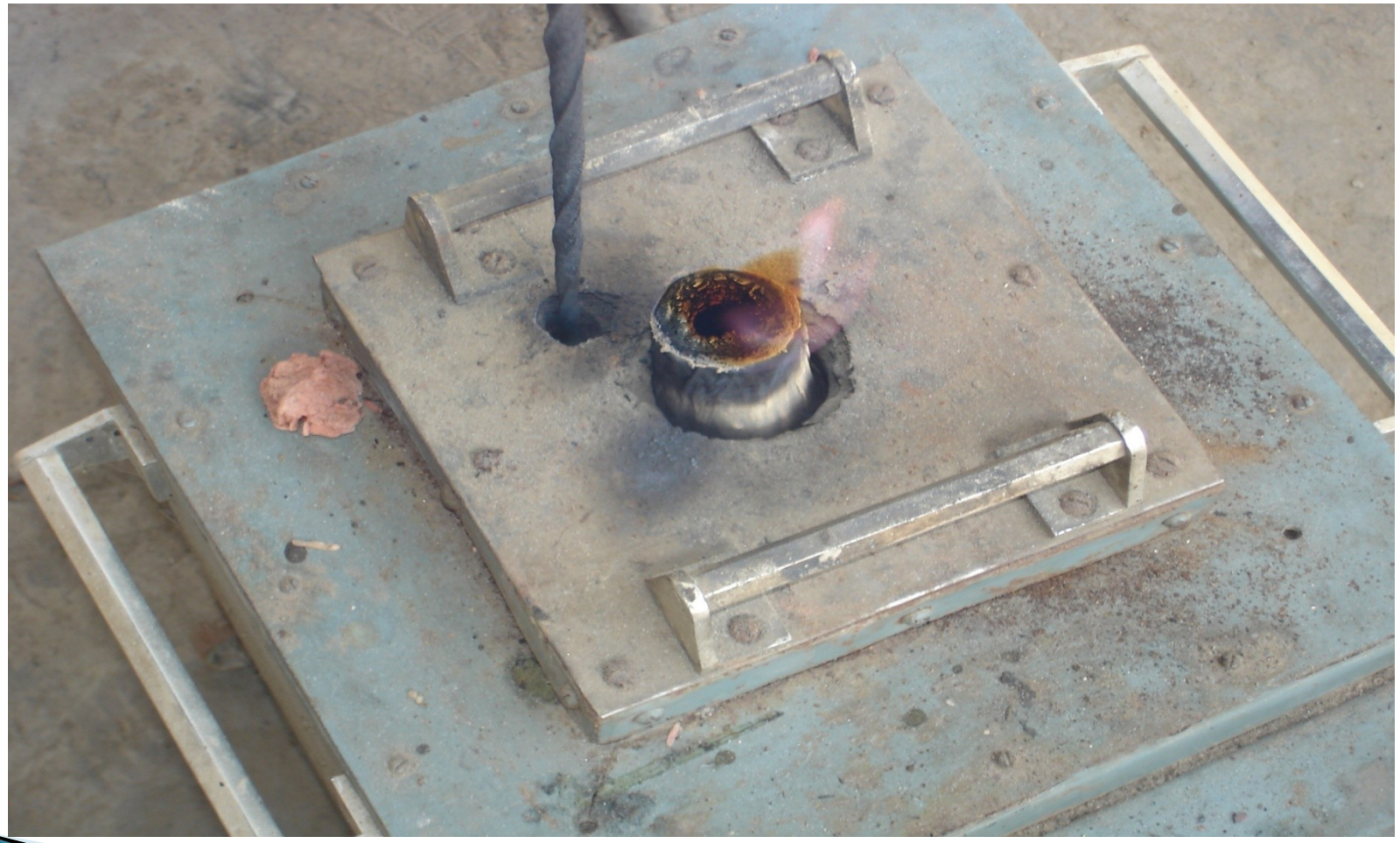
Malla Sindoora- (H .L. Sawhney. *et all* 1973)

- Malla Sindoora partially blocked the action of acetylcholine at the dose of 200mg/kg, 400mg/kg intra-duodenal and 15mg/kg intravenously to the Experimental. Dose. Where as Atropine sulphate completely blocked the action of acetylcholine.
- Malla Sindoora in a dose level 30mg/kg body wt. for 10 days on experimental asthma, after challenging histamine disulphate, significant improvement was observed.

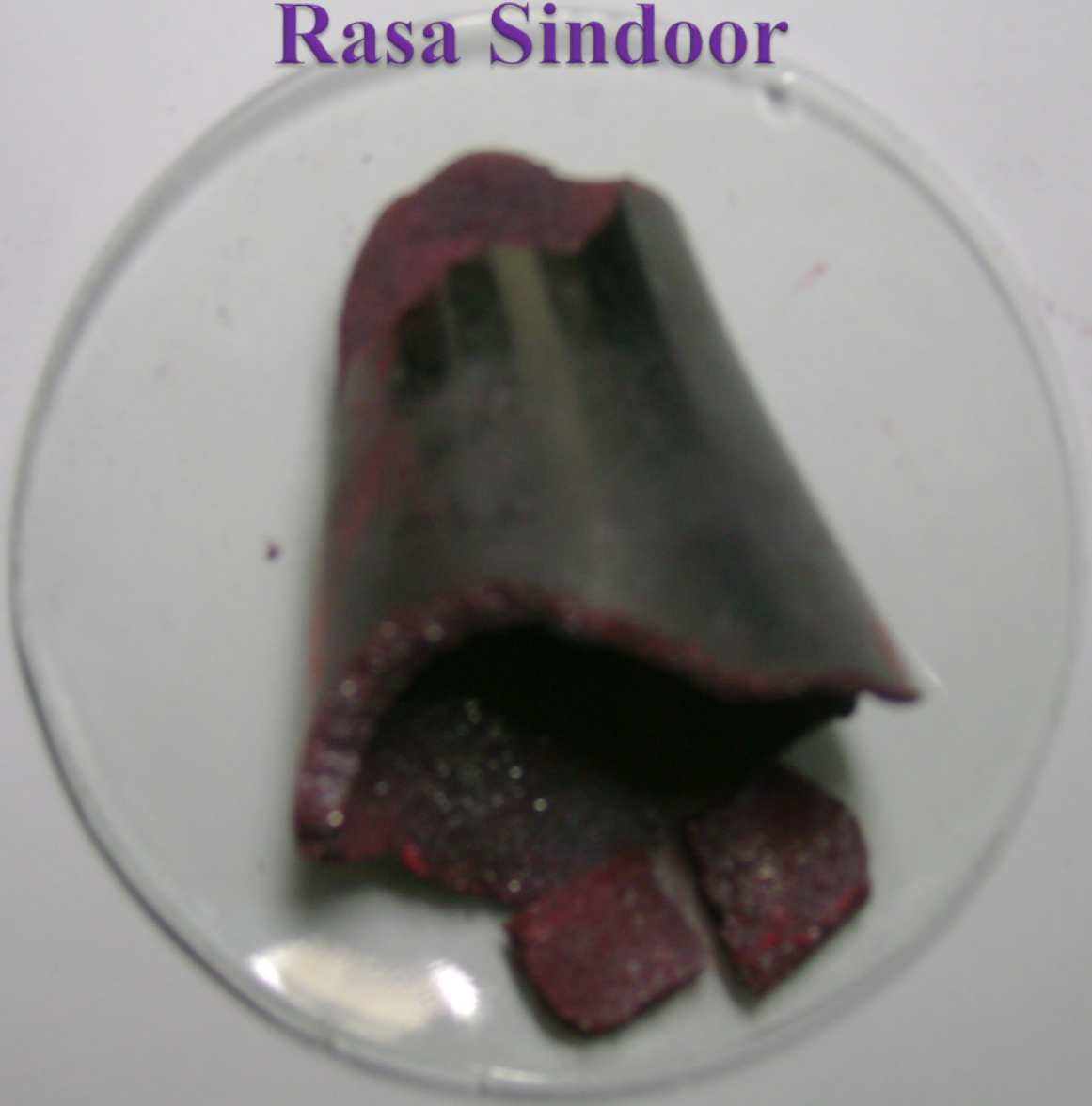
Swarna Vanga- (G Sharma *et all* 1983)

Swarna vanga prevents toxicity of cadmium and regenerative action on partially damaged testicular tissue (Germinal epithelium) on doses of 50 mg/100gm body wt.

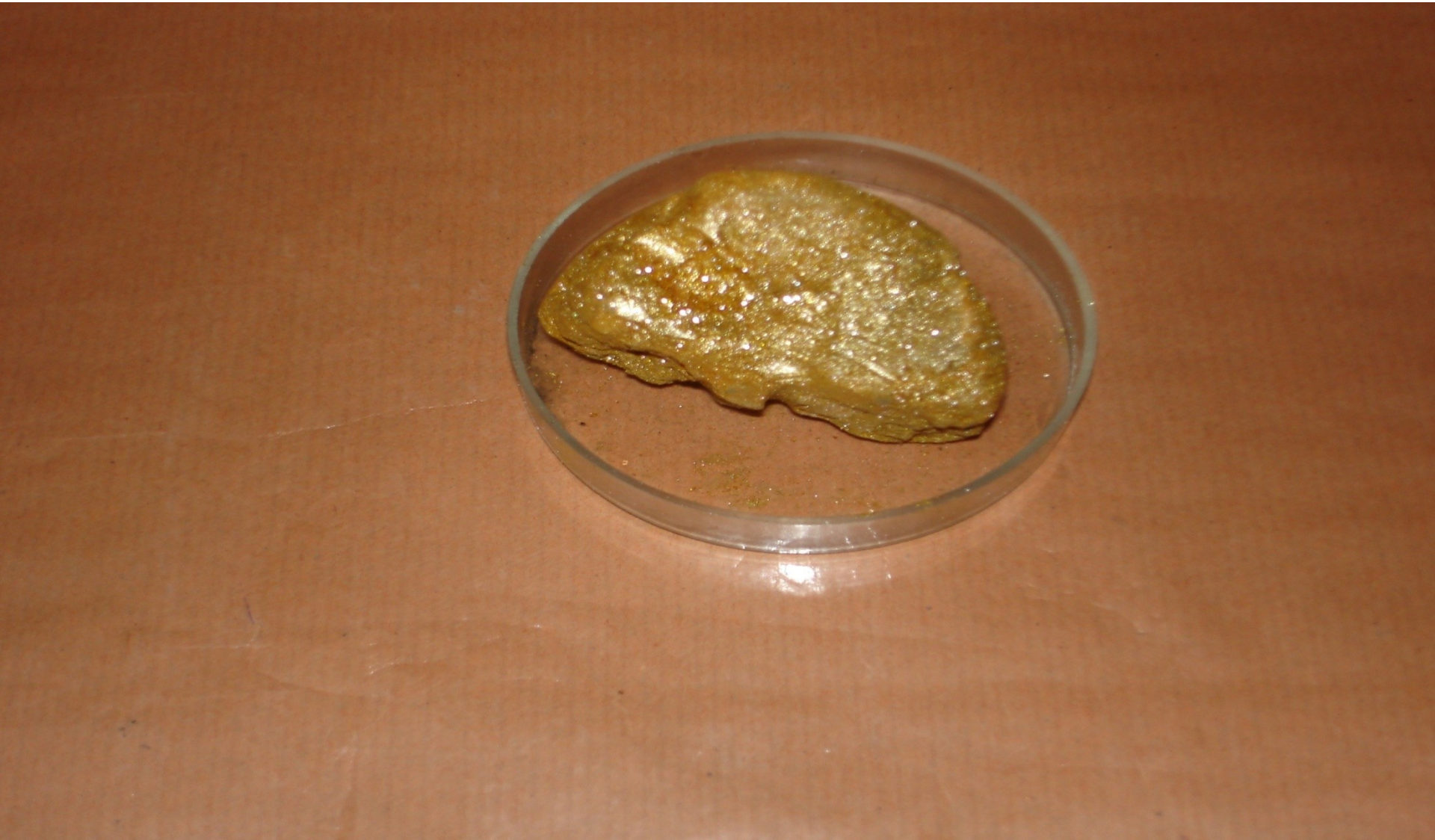
Kupipakwa process



Rasa Sindoor



Swarna Vanga



Discussion

The Kupipakwa Rasanayas are prepared in especially glass bottle, designed instrument, known as ‘Baluka Yantra’. The glass bottle with a long neck (beer bottle) is wrapped with seven folds of cloth smeared with clay and then dried in the sun. That makes the bottle more heat stable. The bottle is buried up to its neck in sand placed in an iron pot; heat is applied from under the pot. This arrangement helps in gradual and homogeneous heating. Mercury and sulphur are the elements mostly used in preparation of various Kupipakwa Rasayanas. In many processes mercury has been used to amalgamate with the metals and form an intermediate product, which could increase the surface reactivity of the metal with other chemical. Sulphur facilitates the formation of respective sulphide.

Mercury itself is being in liquid state, readily reacts with sulphur to form HgS. When mercury is amalgamated with metals, it gets converted into semisolid mass and easily reacts with sulphur to form black sulphide, HgS and thus it promotes the high temperature reaction with other metals. Most of the chemical reactions involve in Kupipakwa Rasayana preparations are heterogeneous kinetics i.e. reaction between solid-gas or solid-liquid and it is known that the rate of such reactions is proportional to the interfacial area. During such reactions, at first a surface layer of the chemical is readily formed (chemical rate controlled) and afterwards the rate of reaction becomes diffusion, rate controlled and slow. The ancient *Ayurvedic* scholars were conscious of these facts and overcame this problem firstly by increasing the primary surface area and secondly by removing the chemical layer formed on the metal particles and thus exposing new metallic surface.

These conditions were achieved by intermittent trituration. In solid reaction, trituration increased the chemical rate kinetics . Sublimation is the chemical process, involved in most of the Kupipakwa Rasayana preparation. It is the unique process converting a solid directly into vapour and condensing the vapor into solid state having the same composition. The gradual heating pattern, use of Baluka Yantra for indirect and homogeneous heating and long necked glass bottle for providing adequate space for re-solidification, should be considered as examples of great knowledge of chemical processes. Now a days electric muffle furnace is brought into practice instead of 'Baluka Yantra' for preparation of Kupipakwa Rasayanas with added advantage of easy regulation of temperature, lack of need of fuel (coal), elimination of smoke and dust, etc. But there are some disadvantages also like high product cost due to electricity charges, and difficulty in large scale production.

The temperature pattern in muffle furnace for preparation of Kupipakwa Rasayanas is also being standardized, like for Mriduagni the temperature range will be 200-250 deg., for Madhyamagni the temperature range will be 250 – 450 deg. and for Teevragni the temperature range will be 450 – 650 deg.. The temperature pattern and duration for preparation of all the Kupipakwa Rasayanas are different, but gradual heating system is followed for all. Preparation of Rasa Sindoora, Makaradhwaja, Malla/Tala/Shila Sindoora need almost same grade of heating but duration depends on amount of free sulphur in the 'Kajjali', here required highest temperature is around 650 deg.. For preparation of Rasa Karpura the highest temperature should not exceed 300 deg. and required duration is 9 h. The highest temperature and duration for preparation of Rasa Puspha are 400 deg. and 9 h respectively. For preparation of Swarna Vanga the highest temperature given is 450 deg. and is needed for longer duration, not less than 12 h. Those make the product therapeutically more potent and less toxic.

Conclusion

In conclusion it may be said that all the Kupipakwa Rasayanas are product of complex chemical processes. The modern analysis of these processes confirms the high level of understanding of the physico-chemical principles and the skill achieved at an early date in ancient India.

Kupipakwa preparation is an unique preparation of Rasa Shastra. Effect of Gandhaka Jarana, grasa of swarna , abhraka etc. and antardhooma, Bahirdhoom out comes are needed to evaluate scientifically on various parameters so that its wide acceptability can be established.

THANK YOU