

PHARMACEUTICAL PROCESSING OF GOLD WSR TO GENERAL PURIFICATION

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ABSTRACT

Metal-based medicines are always in great discussion due to some unknown fear by the modern medical system. Though very few are accepted by them like zinc, magnesium, iron, selenium, etc. Nowadays gold nanoparticles play a great role and interest due to their unique features. Our ancient classics have always emphasized great care before the therapeutic use of such metals and processes like *Sodhana* (Purification) was strictly advised. In the current article pharmaceutical processing of general purification of gold (*Swarna*) is presented.

Keywords: *Suddha Loha, Samanya Sodhana, Kantaka Bedhi patra*

INTRODUCTION

The references to Gold are available in the *Vedic* period by the name "*Hiranya*"¹. The entire *Shree sukta* mentioned the transformation of Gold from inferior metals.¹The relation between *Hiranya* and *Surya* is available in *Rigveda* where it is mentioned that *Ratha charka* (Wheel of Chariot) of *Surya*² is made of Gold. In ancient times, the use of Gold is mentioned

to increase intellectual powers and longevity of life through the procedure of "*Swarna Prasanna*".

Classical Citation*Loha Rasayana*³, *Parthiva dravya*⁴, *Madhuragana*⁵**Table No 1 Verities of Gold in Rasashastra**

In *Rasashastra*, *Swarna* is placed under. *Suddha Loha*^{6,7,8}, *Saralauha*⁹, *Dhatu*¹⁰

Rasarnava ¹¹	Rasa Ratna Samuchaya ¹²	Rasa Prakas Sudhakar ¹³
1. <i>Rasaja</i> (Mercurial Transformation) 2. <i>Kshetraja</i> (Mines) 3. <i>Lauha Sanskaraja</i> (Transformation through other metals)	1. <i>Prakrita</i> (Natural) 2. <i>Sahaja</i> (Mines) 3. <i>Vahnisambhuta</i> (From Agni) 4. <i>Khanija</i> (Mines) 5. <i>Rasa Vedhaja</i> (Mercurial Transformation)	1. <i>Khanija</i> (Mines) 2. <i>Rasaja</i> (Mercurial Transformation)

Gold Origin According to *Rasashastra*

1. According to *Shatapatha Bramhana*, *Swarna* is the semen of *Agni deva*¹⁷
2. Ejaculated semen of Lord *Shiva* vomited by *Ag-nideva* is *Swarana*¹⁸

Acceptable (*Grahyatwa*) and Unacceptable (*Agrahyatwa*) Gold:¹⁴ it becomes red on heating, looks white on cutting, yellow like saffron, on rubbing over *Nikasa*(A type of Stone), Having *Guru*(Heavey), *Mrudu* (Soft), *Snigdha* (*Smooth*) , does not contain impurities like copper or silver is considered as *Grahya* or acceptable. The *Swarna* which looks white, *Kathina* (hard), improper colour, colour changes to

white on heating, *Laghu* (Light)in weight is not considered for medicinal purposes i.e., *Agrahya*.

Pharmacological and Therapeutic Properties:

^{15,16}

Rasa (Taste) - *Madhura Kasaya*
Guna (Property) - *Snigdha, Laghu*
Vipaka(After Digestion) - *Madhura*(Sweet)
Virya (Potency) - *Sita*(Cold)

Karma: *Vrushya* (Aphrodisiac), *Varnya* (Colour Promoting), *Balya*(Strength), *Dipana*(Carminative), *Tridosha nasaka*(Pacify all 3 doshasa), *Swasa*(Anti Asthmatic) *Kasahara*, *Jwara nasaka*(Anti pyretic), *Brimhana*(Anabolic) etc.

Table no 2 Gold Characteristics²⁰

Sl No	Characteristics	Remarks
1	Color	golden "butter" yellow
2	Luster	Metallic
3	Transparency	Opaque
4	Crystal System	Isometric
5	Crystal Habits	massive nuggets and disseminated grains
6	Cleavage	Absent
7	Fracture	Jagged
8	Streak	golden yellow
9	Hardness	2.5-3
10	Specific Gravity	19.3 (extremely heavy even for metallic minerals)

The noble metal Gold is produced as the result of molten rock or magma, being intruded into solid rock. When magma cools and solidifies, water and volatile substances take apart out under high pressure. The pressure of hot water and steam force open fissures in the surrounding solid rock, When the hydrothermal solutions cool, deposition of material occurs¹⁹

Occurrence

Gold can be found throughout the world widely distributed, in very low concentrations, and commonly in its native form as metal. It is usually found along with

Rajata (Silver) often contains little quantities of *Tamra*(copper). Compounds of gold originate in nature

are the tellurides, typically calaverite (AuTe₂), petzite ((AuAg)₂Te), and sylvanite ((AuAg)Te₂), among others. Gold is found in native form in both lode and alluvial deposits.

Synthesis of Gold²²

Gold synthesis or *Rasabedhaja Swarana* is the age-old dream of the *Rasacharyas* or alchemists. Current days It can be achievable in particle accelerators or nuclear reactors, but too much expensive in practice. Au-197 is only one stable gold isotope and nuclear reactions must produce this isotope for gold synthesis. It is therefore not possible to distinguish stable, artificially produced gold from natural gold. by irradiation of platinum or mercury in a nuclear reactor gold can be produced. But platinum is more costly than gold and is unsuitable as raw material. Due to low efficiency and high-cost gold synthesis does not have an economic impact, although in the 50,s small quantity of gold was synthesized by irradiation of mercury in an atomic reactor for demonstration purposes in the USA.

Gold in Human Body

✓ Ahnlide et al. 2002 (Malmo University Hospital, Sweden) reported blood gold concentration to be <0.04-0.15 µg/L analysis by inductively coupled plasma mass spectrometry, for those without dental gold. For those with dental gold, the concentration ranged from 0.04-1.07 µg/L. The detection limit was 0.04 µg/L.²⁵

✓ 1962, Parr and Taylor, demonstrating the determination of gold in biological materials via thermal neutron activation analysis, showed the gold concentration in the human liver to range between 13 and 790 µg/g wet tissue, with a median value of 57 µg/g and a mean of 114 µg. Using a 70 kg human gives us 1610 g, which gives us approximately 0.02 µg of gold (using the mean value). So, a lot more gold hangs around in blood than in the liver.²⁶

Biological Activity in Modern Literature: Gold-compounds treatment is otherwise known as Chrysotherapy or aurotherapy. -

Modern's system of medicine uses the following types of Gold salts²¹

- Auranofin

- Aurothioglucose
- Gold sodium thiomalate
- Gold sodium thiosulfate
- Sodium aurothiomalate

✓ In 1890, the distinguished German bacteriologist Robert Koch won the Nobel Prize for his discovery that compounds made with gold inhibited the growth of bacteria

✓ Daniel N Slatkin et al, 2004 reported the use of gold nanoparticles to enhance radiotherapy in mice²⁴

Swarna Samanya Sodhana: Reference - Ref – AFI (PART I), page no 246(Rasatarangini, Taranga 15; 11)

Method Adopted - Trituration

Materials Required: -

- ❖ *Kantaka vedhi swarna patra* -- 10 gms
- ❖ *Til tail* -- QS (100 ml)
- ❖ *Takra* -- QS (150 ml)
- ❖ *Gomutra* -- QS (150 ml)
- ❖ *Kanji* -- QS (150 ml)
- ❖ *Kulattha Quatha* -- QS (150ml)

Equipment's

- ❖ Asbestos Sheet
- ❖ Silica crucible
- ❖ Gas cylinder
- ❖ Pressure blower (heating device)
- ❖ Tongue

Procedure

99.99 percent pure gold coins were purchased from ICICI BANK (2 coins each weighting 5 gms) then they were pressed by roller machine to convert into the thin plate (with the help of a goldsmith) 10 gms of *Kantaka Bedhi Swarna patra* (Thin gold foil) were first made in to roll from and taken in a silica crucible, which was placed on the asbestos sheet. A gas pressure blower was then used to heat gold coil till becomes red hot. Then with the help of a tongue gold coil was immersed into *Til tail*. The same process was repeated seven times in *Tila taila*. The process of heating and immersing into *Takra*, *Gomutra*, *Kanji*, and *Kulattha kwatha* respectively was also done in the same manner, each time fresh liquids were taken.

Observation: -

3. During Sodhana with Tila taila

Feature Noted in Oil

- ❖ Fire burns more vigorously due to oil
- ❖ The Colour of the oil changed from pale yellow to slightly dark.
- ❖ A typical smell of charred oil was noticed.
- ❖ The very minute sound heard while immersing in *Til oil*

Feature Noted in Gold

- ❖ Gold coil begins to red hot from the inner to outer rings
- ❖ Redness begins to feed as soon as the gold coil is removed from the silica crucible
- ❖ Brightness increases after immersing in Oil
- ❖ Very minute carbon deposition particle was seen over gold coil due to burning of oil.
- ❖ The inner side of the silica crucible was coated with carbon deposition (due to the burning of Oil)

2. During Sodhana with Takra

Features noted in Takra

- ❖ the pH of *Takra* was noted at 4 before quenching and 5 after quenching.
- ❖ All the above observations were noted at the time of *Takra sodhana* except for some variations,
- ❖ More fumes & medium fire were seen on successive heating after quenching in *takra*.
- ❖ The clear sound observed at the time of immersing Gold Coil in to *Takra* may be due to the presence of water.
- ❖ Notable volume reduction was observed on each successive quenching.

Features Noted on Gold

- ❖ The gold coil looks brighter after quenching with *takra*.
- ❖ A very thin white colour layer seen over the gold coil may be due to cream deposition.

3. During Sodhana with Kanji

Features Noted in Kanji

- ❖ the pH of *Kanji* was noted at 4 before quenching and remains the same after quenching.
- ❖ Acidic odour liberated from *Kanji* on quenching.
- ❖ Colour changes from creamish yellow to some darker.

Features Noted in Gold

- ❖ Gold luster looks brighter after quenching may be due to the acidic nature of kanji.

4. During Sodhana with Gomutra

Features noted in gomutra

- ❖ the pH of Cow urine was noted at 8 before quenching and 7 after quenching.
- ❖ Dense fumes are released from urine.
- ❖ The typical odour of cow urine during quenching.
- ❖ No colour change was seen.

Features Noted in Gold

- ❖ Gold colour slightly diminished due to the covering of carbon.
- ❖ Crucible bottom also coated with carbon

5. During Sodhana with Kulathha Kwatha

Features Noted in Kulathha kwatha

- ❖ the pH of *Kulathha kwatha* was noted as 6 before quenching and 7 after quenching.
- ❖ Dense fumes were liberated.
- ❖ A charred smell was noticed.

Features noted in Gold

- ❖ More carbon-coated in Gold

Precautions: -

- ❖ Very careful heating of *Kantaka vedhi swarna patra* is required
- ❖ It should always be in mind that more heat may melt the gold coil a thus may be lost by adhering to the wall of the crucible
- ❖ Quenching was done immediately after red hot and with great care to avoid accidents.
- ❖ A larger pot should be preferred for avoiding handling loss during Quenching
- ❖ At last careful look should apply for any gold particle inside the heating crucible or in the immersing pot.

Weight of Gold coin - 10 gms

Weight of Gold foil -10 gms

Weight Of gold foil after *Samanya sodhana* -
-10.0094 gm

Weight increasing - 0.0094 gm or 94 mg

Reason – This May be Due to the adhesion of carbon at the time of heating and quenching.

DISCUSSION

Generally, gold is considered the purest among all metals used in the *Ayurvedic* system of medicine. Hence according to various literature, its purification is not necessary. But according to *Rasendra Sarasangraha* and *Rasakamadhenu*, *Ashudha swarna* is likely to be harmful i.e *saukhaya*, *Virya*, *Balahani*, and produce various other ailments. The present sodhana process was carried out by Taila, Takra (pH 5), Gava mutra (pH 8), kanji (pH 4), and Kulattha kwath. These drugs possess both acidic and alkaline properties. As these are used alternatively at the same time so they make the gold brittle, soft, shining, and fine which will facilitate further processing. Gold coil looks brighter after quenching done with kanji and takra. The total process is done in a single day.

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