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Research Article

VALIDATION OF PHARMACEUTICAL PARAMETERS FOR SWARNA SHODHANA

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Abstract

Standardization is a process that deals with set up of specific parameters. Ancient sages of Rasashastra have made some standard parameters to evaluate the reproducible procedures like Shodhana, Marana etc. Swarna (gold) Bhasma is one of the most popular medicines of Ayurveda and it should be prepared by following Shodhana and Marana procedures in general. However, these are variable from text to text and person to person. Here an attempt has been made to develop and validate standard manufacturing procedure for Swarna Samanya (General) and Vishesha Shodhana (Specific purificatory procedures). Maximum temperature of Kapota Puta ranges in between 575-580^{0}C. No loss of weight was observed in gold after both purification.

Key words: Swarna; Gold; Shodhana; Samanya; Vishesha; Purification.

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INTRODUCTION

Swarna (gold) is an important metal in Ayurvedic Medicines. It is mentioned in the classics that gold can cure all disorders [1] and increase longitivity of life.[2] Properties of purified gold mentioned in classics are, it is beneficial in disorders of cardiac weakness (Hruddaurbalya), poisoning, beneficial for eyes, increases fetus holding capacity of uterus, useful in burning sensation of body.[3] Charaka also quoted its property against poisoning.[4] Charaka mentioned the use of gold for the purpose of Pusanvahan Vidhi.[5] Here commentator commented that it should be purified. Kashyapa told use of gold in the context of Swarna Prashana Samskara to neonates is to increase immunity.[6] Gold foils prepared from purified gold are having much more properties like it acts as a rejunuvator, increases appetite, cures convulsions, increases power of eyes, good for hyperacidity, stimulates heart, cures hiccup, flatulence, poisoning, analgesic and chronic wound.[7]

Purified gold is directly used for the preparation of Swarna Bhasma which is used in many disorders like, Kshaya (Tuberculosis),[8] increases memory, rejuvenator,[9] cures all diseases, suicidal tendencies, increases blood circulation in brain, osteoporosis, syphilis, sprue, anemia [10]. Its therapeutic properties well assessed by the some scholars [11][12] like analgesic[13] anticataleptic anti anxiety and antidepressant,[14] activity antioxidant,[15] augmenting effect.[16]

Recent studies of gold nanoparticles observed its antiangiogenic properties,[17][18] anti cancer property[19] showed encouraging results. Blood compability studies of Swarna Bhasma,[20] Quantity of gold was observed in semen of healthy fertile men.[21][22] Its role on a normozoospermia,[23] male infertility,[24] oligoazospermia[25] was found having significant results. Safety, toxicity and efficacy studies of Swarna Prashana which contains calcinated gold as an ingredient found nontoxic and safe having specific role in immunity.[26][27]

Sages concentrated more on the purification of gold as purified gold is used directly as a medicine. By using different metals and minerals with herbal juices, number of procedures are mentioned in the classical texts for its purification and it is of two types i.e. Samanya (general) and Vishesha (Specific).[28] Ayurvedic drug purification not only detoxifies the material but also enhances its therapeutic efficacy too.[29] As it is a precious metal, more care should be taken during its purification. Here an attempt was made to validate parameters for the standard procedure of Samanya Shodhana and Vishesha Shodhana of gold.

MATERIALS AND METHODS

Procurement of basic raw material

Gold Biscuit was purchased from the local market of Jamnagar. These biscuits were converted to thin sheet of 48 gauge thickness by passing it through a roller press. The sheet was converted to pieces of 90x2 cm. Tila Taila (seed oil of *Sesamum indicum* Linn.), Tandula (*Oryza sativum* Linn.), Kulattha (seeds of *Dolichos biflorus* Linn.), Gruhadhooma (Carbon of Kitchen chimney), powdered Swarna Gairika (Ochre), Nimbu (lemon), Cow dung cakes and Saindhava lavana (Rock salt) were procured from pharmacy of Gujarat Ayurved University Jamnagar. Gomutra (cow's urine) was collected from local cow shed. Balmikmittika (Soil of anthill), and Ihstika churna (Brick powder) were collected from campus of Gujarat Ayurved University. For the purpose of validation, a pharmaceutical proforma was prepared. For fixing the standards, minimum of three readings of each step were taken. As per

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classical references Takra (buttermilk),[30] Kanji (Sour gruel),[31] Kulattha Kwatha[32] were prepared for general purification. (Table 1)

Table 1: Showing the Raw materials used for Swarna Samanya Shodhana

Sr. No.	Material	Quantity
1.	Unpurified gold flakes	300 g
2.	Tila taila	2.7 lit
3.	Takra	2.7 lit
4.	Kanji	2.7 lit
5.	Gomutra	2.7 lit
6.	Kulatha Kwatha	2.7 lit

Samanya shodhana of swarna (General purification of gold)

Swarna (gold flakes) were heated and quenched sequentially in Tila Taila, Takra, Kanji (Aranala),[33] Gomutra and Kulattha Kwatha for three times in each liquid medias respectively.[34][35][36] (Table 2)

Procedure

Gold flakes were heated on LPG gas blower up to red-hot and quenched in specific liquid media. After self cooling gold flakes were taken out from the vessel, heated and quenched. Temperatures of media before and after quenching were noted. Volume of media and weight of gold leaves before and after quenching were noted. Organoleptic characteristic features of gold and media, pH of media were noted as per pharmaceutical proforma. Different media used for the purpose of general purification were subjected to determination of pH.[37]

Vishesha shodhana of swarna (Specific purification of gold)

It was done by the method of ignition of Kapota Puta.[38] Accurately weighed gold leaves were cut into small pieces (about 4" length). As per quantity mentioned Balmikamrutika, Gruhadhuma, Swarna Gairika, Ishtika Churna and Saindhav lavana were made into paste with juice of citrus medica Linn by trituration process in Khalvayantra (morter and pestle). (Table 4) Each gold flake, was smeared properly with paste at both the sides and kept for drying for three days. After complete drying, materials were kept in the Sharava (earthen pot) and covered with another earthen pot then sealed the junction with mud smeared cotton cloth. The seal was properly dried and Kapota Puta was ignited through 8 Vanyoupala (cow dung cakes). After self-cooling, the Samputa was taken out carefully and opened. The wrapped substances of gold flakes were removed by rubbing with clean cloth carefully at both side and washed with warm water. Same procedure was repeated for another three batches. Each time temperature of heating chamber was noted by pyrometer and weight of gold flakes before and after heating was noted. (Table 5)

OBSERVATIONS

General purification of gold: Gold flakes were heated on LPG gas blower having flame size round about 6 inches. The observed flame temperature ranges between 800^0C to 850^0C. During the immersion in the Tila Taila gold flakes catches fire for few seconds. For first time immersion of red hot gold flakes in Takra immediately after Tila Taila oily drops found floated on Takra. Cracking sound was observed during immersion. Subsequently when gold flakes were quenched in Gomutra it became darker after quenching. Brightness of gold flakes was found increased after quenching in Gomutra. After completing three quenching in Kanji, gold flakes were found bright in colour but shining was decreased and the smoothness of gold flakes decreased. After quenching in Kulattha Kwatha, some carbon particles were found on gold flakes. Brightness of gold flakes was increased after immersion in Kanji.

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Table 2: Showing time taken by Swarna Patra to become red hot during Shodhana

Media	Action Performed	Batches			
		SS 1	SS 2	SS 3	Avg.
		Time (Min:Sec)			
Tila Taila	Before 1st quenching	3:10	2:58	3:17	3:08
	Before 2nd quenching	4:08	3:50	4:28	4:08
	Before 3rd quenching	4:30	4:48	4:30	4:36
Takra	Before 1st quenching	8:12	9:45	7:46	8:34
	Before 2nd quenching	9:34	8:32	10:36	9:34
	Before 3rd quenching	11:03	10:28	11:30	11:00
Kanji	Before 1st quenching	5:10	6:37	5:12	5:39
	Before 2nd quenching	9:38	7:57	9:47	9:07
	Before 3rd quenching	8:47	9:48	10:22	9:39
Gomutra	Before 1st quenching	4:56	5:17	6:39	5:37
	Before 2nd quenching	5:12	5:58	5:47	5:39
	Before 3rd quenching	5:36	6:12	5:32	5:46
Kulatha Kwatha	Before 1st quenching	9:49	8:35	7:32	8:38
	Before 2nd quenching	9:34	10:02	9:12	9:36
	Before 3rd quenching	10:53	9:08	10:10	10:03

SS: Swarna Samnya Shodhana

Table 3: Showing weight and pH change of media after quenching

Media	Before quenching		After Quenching		% of weight loss
	Wt	pH	Wt	pH	
Tila Taila	300	6.66	298	6.24	0.67
Takra	300	4.08	278	4.02	7.34
Kanji	300	2.78	276	3.26	8.00
Gomutra	300	7.32	286	7.38	4.67
Kulatha Kwatha	300	7.48	282	7.36	6.00

Table 4: Showing the Ingredients of Swarna Vishesha Shodhana

Sr. no.	Ingredients for each batch (Total 3 batches)	Total Amount
1.	Ashuddha Swarna Patra (Unpurified Gold)	25 g
2.	Balmikmittika (Soil of ant house)	5 g
3.	Gruhadhooma (Carbon of Kitchen chimney)	5 g
4.	Swarna Gairika (Ochre)	5 g
5.	Ihstika churna (Brick powder)	5 g
6.	Shaindhav lavana (Rock salt)	5 g
7.	Nimbu Swarasa (*Citrus medica* Linn.)	20 ml

Due to this, gold flakes found layered with black colored carbon particles. This layer was difficult to remove after washing it with hot water. Average pH of Kulatha Kwatha was found increased by 0.5 after quenching. (Table 3) Softness of gold flakes was observed decreased after completion of procedure.

Weight of gold flakes neither decreased nor increased.

Specific purification of gold

On an average maximum temperature for Kapota Puta was observed as 581(^{0}C).

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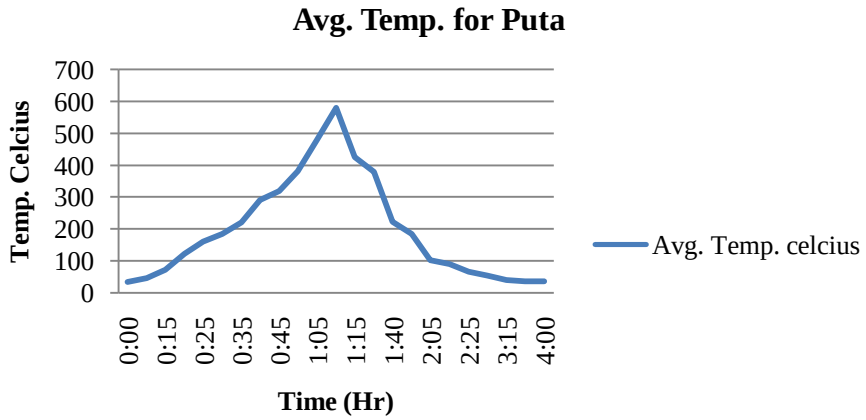
Ayurpharm Int J Ayur Alli Sci., Vol.2, No.9 (2013) Pages 265 - 272

Table 5: Showing the Temperature Pattern for Swarna Vishesh Shodhana (kapota puta)

Time (Hr:Min)	Temperature (^{0}C) for three batches of Swarna Vishesh Shodhana			Avg. Temp. (^{0}C)
	SV1 (^{0}C)	SV2 (^{0}C)	SV3 (^{0}C)	
00:00	35	35	35	35.0
00:10	49	45	47	47.0
00:15	73	68	77	72.7
00:20	122	119	132	124.3
00:25	159	156	168	161.0
00:30	188	173	197	186.0
00:35	219	221	227	222.3
00:40	280	295	302	292.3
00:45	301	326	332	319.7
00:55	373	380	392	381.7
01:05	475	478	486	479.7
01:10	580	574	589	581.0
01:15	430	428	421	426.3
01:20	389	374	379	380.7
01:40	222	216	234	224.0
01:50	183	178	198	186.3
02:05	102	97	110	103.0
02:15	93	88	91	90.7
02:25	68	62	73	67.7
02:40	51	55	59	55.0
03:15	41	42	40	41.0
03:55	38	36	38	37.3
04:00	37	36	38	37.0

#SV: Swarna Vishesha Shodhana

Figure 1: Temperature Graph for Swarna Vishesha Shodhana



Complete self-cooling of ignited Puta was observed after four hours. (Table 5) After self-cooling of Puta, when it was opened gold flakes were observed covered with black colored powdered material. It was easily removed by cleaning it with hot water. It was found that brightness of gold flakes was increased but shining was found decreased. Softness of gold flakes was found decreased. No change in the weight of gold flakes was observed.

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Ayurpharm Int J Ayur Alli Sci., Vol.2, No.9 (2013) Pages 265 - 272

DISCUSSION

Purification term defines itself to eliminate impurities and enhance therapeutic values of material. As mentioned above gold is directly used in a numbers of therapeutic disorders. But it is also found that only purified gold is prescribed for the preparation of gold Bhasma in classics. If it is not properly purified, a number of disorders should be there which also leads to decreases immunity too.[39] In ancient times there may be possibilities of incorporating some other metals like silver, lead, tin etc. to gold in the consequences of money matters. Therefore, scholars would have emphasized more on purification of gold in later period. Now, it is mandatory to purify gold before its therapeutic uses.

In this study observation of media used for purification shows that Tila Taila, Gomutra and Kulatha Kwatha are alkaline in nature whereas Takra and Kanji are acidic. It is also interesting that quenching is mention one by one in alkaline then acidic media. Two hundred years before Christ narrator of Manusmriti told in contexts of purification of metals, where it should be heated and dipped in alkaline and acidic media.[40] Narrator emphasis that it should be purified only after water and heat treatment. There should be some scientific silent facts behind it.

Use of acidic and alkaline media may cause removal of acid and alkali soluble impurities from the metal. It may be possible that use of biological organic media may changes structure of metal by the procedure of Bio benefication. Some theories explain that many autotrophic and heterotrophic bacteria as well as fungi are known to interact with sulphide and oxide mineral in such fashion to remove selectively one or more mineral constituents in an ore. When microorganism interacts with minerals, several consequences are results like adhesion of microorganism to metallic surface.[41] Therefore, there should be specific reasons behind use of organic material for the purification of metals by heating and quenching.

During simple purification, it was observed that heating period was increased after quenching in Tila Taila media. It may be due to solid particles layers of previous media over gold flakes. (Table 3) Maximum eight percent weight loss of liquid media i.e. Kanji was observed. It may be possible that Kanji contains maximum percentage of water content compared to other liquid media. At completion of procedure the brightness of gold flakes was increased but luster was decreased. There was no any change in weight of gold flakes after completion of procedure in all batches and same result was also found in specific purification.

In both samples of purification, hardness of Gold flakes was increased. The hardness was observed by bending gold flake. It was observed that before purification gold flakes easily bends while after purification it took slight pressure. It may be possible that due to increased hardness gold flake will get easily broken. According modern chemistry increasing levels of carbon decreases the ductility of metal. During Shodhana (Purificatory) procedure tension is increased in matter by application of heat causing linear expansion. After heating, immediate cooling in liquid media leads to decrease in tension and increase in compression force.[42] Repetition in heating and cooling cause's disruption in compression tension equilibrium leads to increased brittleness, reduction in hardness and finally reduction in particle size. Some metals and minerals during red hot state react with atmospheric oxygen or steam and form a chemical compound.[43] Therefore, it is claimed that during heating and quenching procedure carbon percentage of gold flake increased. Increased levels of carbon may helps in the calcinations of metals (Metallic Bhasma).[44]

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Ayurpharm Int J Ayur Alli Sci., Vol.2, No.9 (2013) Pages 265 - 272

As it is mentioned in classical texts that after heat treatment there is no any change (loss/ increase) in weight of gold.[45] Modern Science also mentioned the same quote about this noble metal. However, interesting observation was found that luster of gold flakes was decreased after both simple and purified purification methods too. Hardness of flakes was increased after both purifications. It gives specific dimensions that some types of physico-chemical reactions must be there which involves these types of changes in gold flakes.[46] Like another metals during purification no any loss or gross physical or chemical change was observed during purification. It may be reason that some of the classics narrated that pure gold is noble metal so there is no any need of purification.[47]

CONCLUSION

For 100 g of gold flakes, 300 ml liquid media is found sufficient for each quenching without any change in weight of gold flakes. In specific shodhana, maximum temperature of Kapota Puta by cow dung cakes ranges about 575-580^{0}C and it takes maximum four hours for self-cooling after ignition.

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