



CONCEPT OF SHODHANA AND ITS EFFECTS WITH SPECIAL REFERENCE TO TAMRA (COPPER)

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ABSTRACT

Shodhana, which literally means purification & converting drug fit for further procedure, and shodhana is procedure necessary for every drug before taking it for adding in any compound or subjecting it for further processes like Bhasmikiranana (incineration) etc. Purified drug in the lines of modern science is different from that of Ayurveda as the former is absolutely the main drug and latter may contain other particles also, present paper gives the details of shodhana along with such methods practically done on Tamra.

Keywords: Shodhana; purification; Tamra; Hexagonal

INTRODUCTION

In Ayurvedic Medicine the concept of shodhana treatment was in practice since the times of Caraka samhita (1000 B.C. to 500 B.C.). According to it (Caraka samhita) Saucha (Suddhi Karana) was also included in the measures claimed to be responsible for the alteration or addition of the properties of the drugs while subjected to various pharmaceutical operations & treatments. The importance of this shodhana treatment has enhanced further after the development of Rasa/Mineral therapy in the field of Ayurvedic Medicine i.e. from 8th cent. A.D. onwards. In this period the ancient scholars who encouraged the use of mineral drugs in the therapy have also recognized the toxicity of mineral drugs in general & considered as the important basic materials of Rasa/Mineral therapy of India. During their time number of measures and processes were developed for purifying the mineral drugs with a view to remove their toxicity completely or minimize it to the least possible level.

In the course of Shodhana method the drugs of mineral origin are subjected to various grinding, heating, fomenting, subliming, and distilling etc. processes which in turn remove soluble, evaporable and washable impurities from these drugs. For this purpose these drugs are either treated with acidic, alkaline and neutral types of vegetables extractives/ liquids or with oily materials in the presence or absence of heat for specified period.

In some cases only heat treatment is given in a specified apparatus so as to remove their volatile or thermostable impurities. Grinding in hot & cold condition is also done to reduce & disperse the particles of the materials and thus exposing maximum portion of the drug to the purifying material.

These treatments not only remove the soluble, evaporable and washable impurities of the mineral drugs but also add some materials with them which from chemical point of view may be taken as impurities but pharmacological point of view prove beneficial by reducing their toxicity to the great extent. It may thus be pointed out that the Ayurvedic shodhana method is not only a chemical purification but it is something more than that which

sometimes lower the chemical percentage of purity of the material considerably still the treatment is claimed as the purification treatment. Besides Ayurvedic shodhana treatment also impregnate organic materials & their properties in the inorganic drugs/ products to facilitate their utilization by the body tissue & organs. From pharmaceutical point of view shodhana treatment helps in converting the materials in such a state which is suitable for further Marana/ Satwapatana etc. treatments.

In the present paper the role or the effect of shodhana treatment is discussed in relation to Tamra (Copper) which is used in the preparation of many formulations.

Literary Review

Though references regarding the shodhana treatment are available since the time of Ayurvedic classics but the details about this treatment could be traced only after the development of Rasashastra/ Rasachikitsa (Mineral therapy) in Ayurvedic medicine i.e. from 9th cent. A.D. and onwards. Historically development of this treatment could be seen only in mediaeval period i.e. from the period in which mineral/ poisonous and sub poisonous drugs acquired prominence over other types of drugs in the therapy. These drugs acquired prominence because of many superior qualities these possess, than their counterparts. The only disadvantage they have is their high toxicity and very little absorption. If these could be overcome there is no drug which may be compared with such drugs in qualities and effects.

It is with this view mind the shodhana method of Ayurvedic pharmaceutical science has been developed to this extent that is, when applied properly render these drugs either completely free from toxic/undesired side effects or minimize them to the desired extent. Knowing the different nature of impurities, ancient scholars have suggested different types of drugs for their purification as were considered necessary. These scholars developed shodhana treatment not only to remove their toxic materials but to convert them to the pharmaceutically suitable forms in which these may be absorbed into the system if used internally or may be treated further.

Shodhana Methods and their Suitability

Heating & Dipping (Tapanā & Nisechana)

This is a most common type of Shodhana treatment which is applicable in majority of cases i.e. in cases of almost all the metals and majority of gems. In this process materials taken for shodhana purpose are heated to red hot and dipped into the various types of cold liquids (oily, acidic or alkaline types). This heating and dipping is repeated for number of times varying from material to material i.e. depends on the nature of the material (mineral drug).

This method of purification is applicable for the drugs which are very hard in nature, such as iron, Mandura (Iron oxide, mass), Copper, Mica, Diamond etc. which are very hard consistency. The heating to red hot and dipping in cold liquids help in disintegrating the particles and thus reducing their size. This treatment either converts material in coarse powder from by simple hammering. Repeated heat and cold treatment and especially in oily, acidic and alkaline medias plays an important role in this shodhana treatment. This repetition of the process may be adjusted with the hardness of the material. If the hardness is more, the repetition number is also more as in case of diamond this treatment should be repeated even 100 times while in ordinary metal this number is seven for each liquid.

Heating, Melting and pouring into Cold Liquids

This process is applicable in cases in which the drugs melt at a low temperature, such as Lead, Zinc, Tin and Sulphur. This treatment also needs a few repetitions to convert the material into coarse granules and to brittle state. In case of Sulphur, ghee is added while melting with a view to remove fat soluble impurities and then melted sulphur is poured into cold milk or vegetable extract through a filter cloth to remove insoluble impurities (stony particles and dust) on the filter cloth and water soluble impurities in milk and vegetable extractives. The treatment of sulphur, with ghee and milk which, according to Ayurveda, have been recognized as detoxicating agents, are likely to reduce its toxicity to a certain extent.

Grinding with Herbal Drugs and Their Extracts

This process is applicable in cases of drug which are soft in nature, such as Mercury, Kasisa, Gairika, Hingula, Manashila etc. The drugs which are purified with 'Bhavana' are included in this group. Here the drugs are treated with the paste of certain herbs and other drugs such as salts, alkalies, carths and some vegetables extractives having acidic/ alkaline reactions or with acidic juices and or/ or fluids for a specified period. In case of Parada, Mardhana (grinding) is recommended in Tapta-Khava (hot mortar). In this process the drug to be treated is reduced to fine particle to expose its maximum part to is the purifying materials (drugs/liquids). In this way, forcing each particle to come into contact with the purifying drug and thus allowing soluble impurities to go into the solution and soluble materials of the purifying substance to enter into the drug. This phenomenon helps to remove the soluble impurities to go out and useful materials to be added to the drug. This could be detected with the chromatographic studies.

Fomenting or Boiling with Liquids

This is also a common method of purification applicable to many drugs. Here the drug is allowed to remain in contact with boiling liquid for at least three hours. The

impurities which are soluble only in boiling hot acidic or alkaline liquids could be removed through this process. The drugs purified with swedana process come under this group. Sometimes the paste of certain drugs is also placed along with the drugs. This also helps in accelerating the soluble impurities to go into the solution of boiling liquid. This method is applicable in cases of Mercury, Haritala, Manashila, Sankha, Sukti, Varata, Mukta, Pravala and a few precious stones. In some cases this method removes soluble impurities and in some cases external impurities.

Sublimation and Distillation

These are applicable in cases of drugs which may have low vaporization point. In this process the drugs are treated with acidic fluids either mixed with vegetables or with mineral drugs and made into the paste which when put in a special apparatus (urdhwapatana yantra damaru yantra, adhapatana yantra or tiryaka patina yantra) and heated strongly sublimes or distills as pure material either in upwards, downward or in trans-verse directions. In this way Mercury, sulphur, navasara etc. drugs are purified.

Soaking in the Liquids

This is applicable in cases of vegetable poisons such as Vatsnabha, Ahiphena, Gunja etc. and Shilajatu. In this process the drugs which are to be purified are cut into pieces and soaked into the liquids such as Gomutra, Kanji etc. for at least three days i.e. allowing sufficient time to the drug to remain in contact of purifying liquid, so as to allow its soluble poisonous matters to go into the liquid (solution) and making the drug purified. In case of Guggulu soaking in boiled water is done.

Frying

This is applicable in cases of drugs which either contain water or volatile substance such as spatika, tankana swarna- makshika etc. here the purifiable material is put into the iron pan and subjected to heating with or without adding any material/ liquid while heating. In this process constant stirring of the material is done till the water of crystallization evaporates and the material becomes puffed or till the added liquid is evaporated and the material is converted into red. In case of Hingu frying in ghee method is applied. Here also moisture content is lost and material becomes light and puffed.

Purification of Tamra

According to Rasagranthas (Rasashastra Texts) there has been a mention of two varieties of Tamra based on place of availability & properties. Of the two varieties Nepaliya variety of Tamra is recommended for medicinal use. According to the texts of Rasashastra it is clearly mentioned that Tamra is used internally after proper purification and other required procedures, otherwise it may cause following eight doshas (toxic signs) in the body,

Bhrama (vertigo)

Murcha (unconsciousness)

Vidaha (burning sensation)

Swedotpatti (sweating)

Kledana (wetness)

Vamana (vomiting or nausea)

Aruchi (anorexia) and

chitta santapa.

Shodhana Method of Tamra

Procedure for samanya shodhana

For this first prepare fine Tamra sheets, then these are heated to red-hot and quenched into five liquids (Tila Taila, Takra, Gomutra, Kanji and Kulatha kashaya) serially seven times in each liquid. After completion of samanya shodhana Tamra sheets should be subjected for visesha shodhana also,

Procedure for Visesha shodhana

For this samanya shodhita Tamra sheets are pasted with the paste prepared with saindhava lavana with Nimbu swarasa and heated to red hot on fire then quenched in Suoveeraka for eight times.

Aims of the study

The study is aimed to assess the physical and chemical change in the sample of Raw Tamra after shodhana process.

MATERIALS AND METHODS

Raw materials of Tamra that is Tamra patras (sheets) were taken from M/S Halakatti Ayurvedic Raw drug shop, Bijapur.

Tamra Samanya Shodhana

Materials: Quantity

Raw Tamra: 3600 gms

Tila taila, Takra, Gomutra, Kanji and Kulatha Kashaya: Q.S

Equipments

Steel vessels, Gas Stove, Cylinder, Big vessel, Iron cauldron and Big specula etc.

Method

Above-mentioned amount of raw Tamra was taken in iron cauldron, heated up to red hot and then immediately immersed in Tila taila. The same process was repeated for seven times in Tila taila and also in takra, gomutra, kanji and kulatha kashaya. Each time fresh liquid was used for dipping.

Tamra Visesha Shodhana

Materials: Quantity

Samanya Shodhita tamra churna: 2000 gms

Saindhava lavana: 2000 gms

Nimbhu swarasa and Suoveraka: Q.S.

Equipments: Iron cauldron, gas stove, cylinder, big specula, big vessels etc

Method

Fine powdered saindhava lavana triturated with Nimbu swarasa to prepare fine paste of saindhava lavana. This obtained paste was mixed with samanya shodhita tamra churna, the mixture dried well, then it is heated strongly up to red hot and then immersed immediately in suoveraka, this whole process was repeated for eight times.

OBSERVATIONS & RESULTS

Table 1: Variation in color and weight of Tamra during Samanya shodhana

	Weight	Wt loss	Color	Form
Raw tamra	3600 gms	-	Reddish shiny	Patra (flake)
In tila taila	3590 gms	10 gms	Blackish red	Patra
In takra	3580 gms	10 gms	Blackish red	Patra
In gomutra	3560 gms	20 gms	Reddish	Small pieces
In kanji	3555 gms	5 gms	Blackish red	Small pieces
In kulath kwath	3520 gms	35 gms	Reddish black	Coarse powder

Visesha shodhana of Tamra

Observation

- 1) When the mixture of Saindhava lavana and Limbu swarasa was applied over Tamra churna, the color became greenish black after drying.
- 2) While dipping red-hot Tamra churna in a vessel containing suoveeraka hissing sound was heard.
- 3) The colour of liquid became greenish black.
- 4) The reddish black colored Churna became black colored after Shodhana process.
- 5) The churna became very soft.

Table 2: Showing the Results of Visesha shodhana of Tamra

Wt. of Tamra churna before visesha shodhana	2000gms
Wt of Vishesha Shodhita Tamra churna	1980gms
Loss in weight	20gms
Color	Blackish

Elemental Analysis By Using ICP-AES

Table 3: Results in micrograms/gm (ppm) or % as indicated

ELEMENTS	RT	SST	VST
CU	99.83%	79.56%	42.18%
Fe	0.057%	0.13%	0.41%
S	0.025%	0.096%	0.19%
Ni	0.021%	0.037%	0.019%
Ag	ND	54.65	32.91
Al	8.12	1.35%	2.60%
Si	94.27	0.021%	0.026%
Pb	0.043%	0.043%	0.020%
Na	-	-	12.60%
Hg	-	-	-
As	-	-	-

ND-Not Detected

The X-RD Analysis

The X-RD analysis was done in Regional Research Laboratory Bhuaneshwara.

The final unit cell parameters for two samples have been given below

Table 4: Unit cell volume and shape of different samples of tamra

Sample	Volume(A ⁰)	Shape of the unit cell
R.T	637.852	Hexagonal
V.S.T	390.984	Monoclinic

DISCUSSION

Raw Tamra when subjected for samanya shodhana, the physical & chemical properties changes in its different stages of shodhana.

When raw Tamra was subjected for samanya shodhana in Tila Taila, the weight was reduced to 3590 gms. From 3600 gms. and colour was changed from reddish to blackish red.

In Gomutra shodhana Tamra lost 20 gms of weight & reddish colour was regained. And in Kulatha kwatha shodhana 35 gms. Weight loss was noted and colour turned towards black, this change may be due to repeated heating & quenching in different liquid medias having different pH & properties.

The hardness of Tamra patra was reduced & it was converted into coarse powder form after samanya shodhana, again this is also because of repeated heating & quenching in different liquid medias.

In vishesha shodhana of Tamra again weight was reduced to 1980 gms. From 2000 gms, the colour was totally changed to black & converted on soft & brittle powder, this may be due to action of Saindava lavana, Nimbu swarasa & repeated heating & quenching in suoveraka.

Raw Tamra, Tamra after samanya shodhana & vishesha shodhita Tamra samples were subjected for elemental analysis by using ICP-AES, it was observed that Cu, Fe, S, Ni, Al, Si & Pb elements were noted in Raw Tamra and Ag was noted in Samanya shodhita Tamra & Vishesha shodhita Tamra this may be due to procedure carried out for shodhana of Tamra.

There was decrease in the percentage of Copper from raw to samanya shodhita & samanya shodhita to vishesha shodhita i.e. from 99.83% to 79.65% & from 79.65% to 42.18%, this may be due to different shodhana procedures applied on raw Tamra.

Iron percentage was increased in vishesha shodhita Tamra when compared to raw Tamra i.e. 0.057% to 0.41% this was again the effect of shodhana procedure followed for Tamra.

There was decrease in the percentage of Ni & Pb from 0.021% to 0.019% & 0.043% to 0.020% respectively this may be due to samanya & vishesha shodhana procedures followed for Tamra shodhana.

X-RD analysis was done at regional Research Laboratory Bhuvaneshwar, it was observed that the cell type in case of Raw Tamra (RT) was Hexagonal with cell volume 390.984A⁰; the cell type of Vishesha Shodhita Tamra (VST) was monoclinic with cell volume 390.984A⁰, this indicates that when Raw Tamra was converted to Vishesha shodhita Tamra (VST) by series of shodhana procedures, there was change in the cell type, it changes from Hexagonal to Monoclinic.

CONCLUSION

The weight of Raw Tamra was reduced to 3520 gms. from 3600 gms. after samanya shodhana. (80 gms. total loss). The colour of Raw Tamra was changed to Blackish from Reddish when subjected to Samanya shodhana. The hardness of Raw Tamra was reduced & which was converted in to soft and brittle after samanya shodhana. The weight of Samanya shodhita Tamra was reduced to 1980 gms. from 2000 gms. After Vishesha Shodhita process. (20 gms. loss). The colour of Tamra turned to black after vishesha shodhana. Cu, Fe, S, Ni, Al, Si & Pb elements were noted in Raw Tamra. Ag was noted in Samanya shodhita & vishesha Shodhita Tamra samples. The percentage of copper was reduced in Vishesha shodhita tamra than Raw Tamra (From 99.83% to 42.18%). Iron (Fe) percentage was increased in Vishesha shodhita Tamra (From 0.057% to 0.41%). There was decrease in the percentage of Ni & Pb in Vishesha shodhita Tamra samples. (Ni from 0.021% to 0.019% and Pb from 0.043% to 0.020%). The cell type in case of raw Tamra was Hexagonal with volume 390.984A⁰. The cell type in case of vishesha shodhita Tamra was Monoclinic with volume 390.984A⁰.

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Abbreviations

R.T - Raw Tamra
S.S.T. - Samanya shodhita Tamra
V.S.T. - vishesha shodhita Tamra
X-RD - X-Ray Diffraction
ICP-AES - Inductively coupled plasma atomic emission spectroscopy.

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