



Impact of Various Processes (*Samskara*) in Ayurvedic Pharmaceuticals

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Abstract

In *Ayurveda* pharmaceuticals, herbal drugs, minerals, metals, and gems are used as raw materials. Most of the minerals and metals are obtained from the mines and hence there is every chance of impurities and heterogeneous qualities due to the mixing of various substances and impurities. Hence these minerals and metals have to undergo various *samskaras* (processes) before being converted into medicines from raw states and then subsequent use for internal administration. Due to these processes, the natural qualities of the drugs get modified and converted into new therapeutic properties. The present study is planned to identify some important processes of *Rasashastra* (Indian alchemy) and their impact on the physical, chemical and therapeutic properties of the final product. Conversion of a raw drug into medicinal form has a mammoth impact such as palatability, increased shelf life, feasibility during travelling, maintaining accurate dosing and ease of administration. *Shodhana* (detoxification) brings out physical, chemical and biological changes in the drug. Wet trituration modifies the analytical parameters of the drug which in turn facilitates the absorption process. Due to *maranaa* (incineration), toxic effects are nullified and drugs become therapeutically more effective. Thus, various processes described in *Rasashastra* show multidimensional pharmaceutical and therapeutical implications in Ayurvedic pharmaceuticals.

Keywords: *Bhavana*, Impact, *Kupipakwa* Preparation, *Maranaa*, *Rasashastra*, *Shodhana*

1. Introduction

Ayurveda, the science of life mainly deals with maintaining positive health, curing deadly diseases and prolonging the life span¹. To achieve these aims and objectives a much-specified branch *Rasashastra* and *Bhaishajya Kalpana* is developed commonly known as Ayurvedic Pharmaceuticals. *Rasashastra* - Indian alchemy mainly deals with mercurial preparations including mercury, minerals, metals and gems whereas *Bhaishajya Kalpana* mainly deals with preparations of herbal or plant-origin drugs. The drugs which we use

for the preparation of medicines, i.e. for *Aushadhikaran* obtained from various sources such as plants, animals, water and earth.

Most of the metals and minerals are obtained from the mines and hence there is every chance of impurities and heterogeneous qualities due to the mixing of various substances. Hence, these minerals and metals have to undergo various *samskaras* (processes) before being converted into medicines from raw states and then subsequent use for internal administration. *Samskara* is a critical concept described by *Ayurveda* seers and is defined as the conversion of the inherent

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qualities of a drug into new properties^{2,3}. It is a process by which the natural qualities of the drugs are modified.

References are found since the Vedic period showing different *Samskara* involved in various medicinal preparations. These processes include *Shodhana* (Purification/potentiation), *Maranaa* (incineration/calcination), *Jarana* (Oxidation/polling), *Amritikaran* (Augmentation of nectar-like qualities), etc. These processes help the drug to convert into a more suitable form to use for therapeutic purposes without exhibiting any toxic symptoms. Any drug can be converted into different dosage forms as per the disease conditions and it can be made even more potent by impregnating with the juice or decoction of the same drugs⁴. Thus entirely new therapeutic qualities of drugs can be manifested after *Samskara*.

There is also a rich tradition of using poisonous and semi-poisonous drugs in several formulations for the treatment of various disease conditions. The formulations containing poisonous medicinal drugs may show some adverse effects if used without the proper *shodhana* process. Hence it is important to have proper knowledge of the poisonous plants, their *shodhana* procedures and their judicious therapeutic uses⁵. Acharya Charaka has pointed out that poison in a small dose can be a medicine and medicine in a large dose can be a poison⁶.

Though references to various processes are available since the Vedic period, the details about procedures and their extensive use could be traced only after the development of *Rasashastra* (Indian alchemy) in *Ayurveda* science during the medieval period (7th – 15th Century AD)⁷. Metals, minerals, gems, and poisonous and semi-poisonous drugs acquired a reputation over herbal drugs due to superiority in a small dose, palatability and quick action^{8,9}. Hence, the attempt is made in this paper to discuss some important processes of *Ayurveda* pharmaceutics, especially in *Rasashastra* and its impact on the physical, chemical and therapeutic properties of the final product.

2. Materials and Methods

The following method is adopted to pertain to the data in this review paper. Relevant references were

investigated concerning various processes such as *Shodhana*, *Jarana Marana*, *Amritikaran*, *Bhavana* and *Kupipakwa Kalpa* to extract the information described in *Ayurveda* treatises and *Rasashastra* classics, modern pharmaceutics, *Ayurveda* Formulary of India and *Ayurvedic Pharmacopoeia* of India. Internet, e-books, and Journals, the thesis also searched for information. Various databases such as Google Scholar, Pubmed, SCOPED, and DHARA, were searched from Jan 1985 to Dec 2021 using the keywords *Samskara*, *Bhavana*, *Shodhana*, *Maranaa*, trituration, wet grinding, *Bhasma*, Herbomineral formulation with mesh terms like OR and AND. All the identified articles were screened by thorough reading, compiled and discussed thoroughly for an in-depth understanding of the concept of the impact of various processes in *Ayurvedic* pharmaceutics. MS Excel was used for the data extraction.

3. Results and Discussion

3.1 *Shodhana Samskara* (Detoxification Process)

In *Rasashastra* various methods are advised to purify each mineral drug. *Shodhana* means ‘purification. Minerals are impure in their original form and not fit for therapeutic purposes. They enfold many impurities and toxins and may cause many untoward effects in the body. To neutralize these toxins, the minerals are subjected to many *shodhana* procedures in which they are treated with acidic or alkaline herbal juices or liquids with or without heat for a specified period. Few minerals are subjected to the only heating process in a specially designed instrument to remove their volatile or thermo-stable impurities. All these processes help to remove physical and chemical impurities, neutralize the toxins and potentiate the minerals¹⁰. Since the Samhita period, various *shodhana* procedures have been in vogue. Charaka used the terms *Shuddha* (purified) and *Shaucha* (washing) for these processes¹¹.

3.2 Processes of *Shodhana*¹²

3.2.1 Heating and Dipping (*Nirvapa*)

This method of purification applies to hard materials like metals, minerals and gems. In this process, the

materials are heated red hot and immersed into the specified liquid media, e.g. all metals and mica.

3.2.2 Heating, Melting and Pouring into Liquids (Dhalana)

It is the process of pouring the molten metals into the liquid specified. This method is used for metals having low melting points like Tin, Lead and Zinc.

3.2.3 Boiling Under Liquid Bath (Swedana)

It is a general method of detoxification. The drug is boiled in prescribed liquid media through a specially designed instrument called *Dolayantra*. This process is relevant to those drugs whose impurities are soluble only in hot acidic, alkaline or fatty media, e.g. Mercury, Orpiment, Realgar, Calcium compounds, etc.

3.2.4 Distillation (Patana)

This method is applied to the drug-like Mercury and Sulphur, which have a low vaporization point.

3.2.5 Trituration with Herbal Drugs (Bhavana)

The process is applied to soft drugs. It is a process by which the powders of drugs are ground to a soft mass with liquid media and allowed to dry. e.g. Cinnabar (*Hingula*), Blue Vitriole (*Kasis*), etc.

3.2.6 Soaking in Liquids (Nimajjan)

Mainly applicable in the case of vegetable and poison drugs, e.g. Aconite and Nuxvomica, etc. in which drugs are soaked in liquid media and dried in sunlight till the complete evaporation of liquid.

3.2.7 Frying (Bharjan)

This process is useful when drugs either contain water of crystallization or volatile impurities, e.g. borax (*Tankana*) or alum (*Sphatika*). Some drugs are fried with specified liquid/fatty media at mild temperatures, e.g. Nux vomica seeds (*Kupilu*) and red oxide of iron (*Gairika*).

3.2.8 Absorption (Achushana)

The fatty content of certain toxic drugs is minimized through different absorption means, e.g. *Bhallataka* (*Semicarpus anacardium* Linn) *shodhana* with brick powder.

3.3 Impact of Shodhana Processes on Drugs

3.3.1 Physical Changes during Shodhana

a) Removal of physical impurities and toxic principles, b) Reduction in hardness, c) To increase brittleness - due to repeated heating and quenching micro-cracks are developed on the surface of metals/minerals/gems and they convert into soft and brittle to proceed for the pharmaceutical process like incineration, d) Reduction in particle size.

3.3.2 Chemical Changes during Shodhana

a) Removal of chemical impurities, b) Formation of new compounds, e.g. during red hot stage oxidation occurs in metals and non-metals and oxides are formed.

3.3.3 Biological Changes during Shodhana

The physicochemical changes eventually increase bioavailability and reduction in particle size leads to absorption process due to increased surface area. Smoothness leads to non-irritability and chemical changes make the metals body-friendly and suitable for ingestion like *Vatsanabh* (*Aconitum ferox* Wall) purified in cow's urine is converted into a cardiac stimulant without affecting its antipyretic activity whereas crude *Vatsanabh* is claimed to be a cardiac depressant^{13,14}. Seeds of *Kupilu* (*Strichnos nuxvomica* Linn.) purified in cow's milk show Central Nervous System (CNS) depressant activity¹⁵, *Anjana* (collyrium) purified in the juice of *Bhringraj* (*Eclipta alba*) is proved non-toxic to eyes in experimental animals. Thus with the process of *shodhana*, drugs become homologous to the cells, their toxicity is reduced to the body's tolerance limit and increase the cells' acceptability¹⁶.

3.4 Jarana Process

Before *Marana*, *Puti lohas* (Group of inferior metals - Lead, Tin and Zinc) are subjected to an intermediate process called *Jarana*. In this process the molten metal is rubbed hard with an iron ladle, added herbal powder and reduced to powder form.

In this process lead etc metals are divided into fine atoms and turn into an alloy after being mixed with the metallic portion of the herbs used for the process. Thus *Jarana* process creates an oxide form of metal with a mixture of organic ash. High temperature

with constant rubbing helps to facilitate the oxidation process of metals which leads to conversion into powder form and makes it suitable for the further process of incineration¹⁷⁻¹⁹.

3.5 Marana Process (Incineration/ Calcination/Bhasma Preparation)

Marana means to kill. *Marana* is a process by which purified metals and minerals are ground to paste with various liquids and herbal juices and when dry reduced to *bhasma* by applying the required quantum of heat in a measured manner (commonly known as *puta*)²⁰. Various metals, minerals, gems and other animal products are used after converting them into *bhasma* or *pishti* form and reduced to the finest particles. For the *Marana* process, heating is essential. The *Puta* system is prevalent in the *marana* process. *Puta* is the quantum of heat applied for the *Marana* of mineral materials. To obtain the different quantum of heat, from small to bigger, different-sized pits are used. Pits are filled with conventional fuel like cow dung cakes/husks/firewood to generate heat. This way different-sized pit has been designed. Mineral drugs are of different chemical nature. Some are stable on fire whereas others are volatile or inflammable. The purpose of *puta* is to facilitate the compounding process with proper prevention to get desired quality *bhasma*.

The steps involved in the *marana* process are as follows²¹:

- The purified drug is put in a stone mortar and pestle and ground with juices of specified plants of drugs mentioned for a particular drug for a specified period.
- Small cakes (*chakrikas*) are made with the ground paste of the minerals and dried well under the sunlight and placed in one single layer in a shallow earthen saucer (*sharava*) and closed with another such saucer. The edge or joint is sealed with clay-smear cloth in seven consecutive layers and dried.
- The sealed earthen saucer is then placed in the fireplace (*puta*) for incineration. Fire of cow dung cakes is then ignited on all four sides and in the middle of the pit. When the burning is over, it is allowed to cool completely. The earthen container is removed, the seal is opened and the contents are taken out and powdered. The process is repeated

several times as per the nature of the drug and the desired quality of the product is obtained.

3.5.1 Impact of Marana

Through the process of *marana*, various changes are attributed to the drug.

After *marana* metals and minerals are reduced to ash (*bhasma*) form and the therapeutic qualities (*gunantaradhan*) of the material. *Bhasma* thus obtained becomes light, fine (*sukshmatva*), lusterless (*nischandratva*), smooth, floats over the surface of the water (*varitaratva*), and enters in the furrows of fingers (*rekhapurnatva*) and non-reversible (*apunarbhava*)²². Due to *marana* toxic effects are nullified and make the drug therapeutically more effective^{23,24}.

A variety of juices is incorporated in a range of processes of *shodhana* and *marana* making the drugs therapeutically more effective. The drug that appears in the finishing form seems to have an improved bioavailability, especially through the digestive system. Due to the particle size reduction, all the *bhasmas* could be easily absorbed into the system, mixed with *raktadi dhatus* (*blood and other tissues*) and produced their desired effects without producing harmful side effects. Conversion of material into therapeutically suitable compounds helps to perform a specific therapeutic activity and conjugation of trace elements fulfils the demands of trace elements in the body²⁵.

3.6 Amritikaran (Augmentation of Nectar-like Qualities)

Amritikaran is an important procedure described in the context of the *Marana* process. The purpose of this process is to remove the remaining bad effects of *bhasmas* which are likely to remain in the *bhasmas* even after the *marana* process. This process is specifically advised for *Abhraka* and *Tamra Bhasma*. After this process, the *bhasmas* become suitable for therapeutic uses²⁶.

3.7 Bhavana (Wet Levigation)

Bhavana is an important *samskara* in Ayurvedic pharmaceutics which not only leads to bringing desirable changes but enhances the potency of the drug²⁷. In Ayurvedic pharmaceutics, *Bhavana* is frequently used and a part and parcel of almost

all modes of processes viz. *shodhana*, *marana*, *amritikaran*, *satwapatan* (metal extraction) and various herbomineral preparations. *Bhavana* is an exceptional pharmaceutical process in which a drug or mixture of drugs in powdered form is ground in a pestle and mortar to a soft mass with a sufficient quantity of liquid media (juice, decoction, cow's urine, milk, etc.) and allowed to dry²⁸. The powdered material is called *Bhavya Dravya*, and the liquid media is termed *Bhavana Dravya*. *Bhavana* process has immense importance applied in the preparation of various dosage forms; *Gandhak Rasayan*, *Chausastaprahari pippali*, *Arogyavardhini vati*, and *Sanjeevani vati* are some of the well-known formulations prepared by the *Bhavana* process.

3.7.1 Guidelines for *Bhavana*²⁹⁻³¹

1. Soak the powdered drug/drugs with liquid (decoction/juice/any other liquid) overnight and carry out the levigation process in the daytime in the presence of sunlight.
2. The quantity of *Bhavana dravya* must be sufficient which makes the *bhavya dravya* moist or submerged with *Bhavana dravya*.
3. Acharya Charaka has the opinion that the qualities and potency of *bhavana dravya* may be similar or opposite to that of *bhavya dravya*.
4. In the decoction preparation, the quantity of *kashaya dravya* must be equal to the quantity of the substance to be triturated and 8 times the quantity of water to be added and after boiling, it should be reduced to 1/8th part. If fresh juice is not available for *Bhavana* then it may be replaced by decoction.
5. Confirmatory test: The levigation must be continued till the mass becomes soft and will be able to be rolled in between fingers without being sticky and cracking on pressing (*Subhavita lakshana*).
6. Advocate the *Bhavana* process during the winter or summer season and avoid in rainy season due to the presence of moisture in the atmosphere.
7. If the duration of *Bhavana* is not disclosed, then it should be continued for seven days.
8. *Khalvayantra* (mortar and pestle) made up of stone or porcelain is ideal for the process of *Bhavana*.

Thus the number of factors such as *bhavya dravya*, *bhavana dravya*, number, duration and method of

Bhavana and confirmatory tests attributed to the total outcome of the *Bhavana* process.

3.7.2 Impact of *Bhavana*³²⁻³⁴

1. During the wet grinding process, two or more materials are mixed homogeneously and the mixture becomes smooth, soft and sticky, which supports better binding of material and pills or tablets can be made easily.
2. Various herbal juices employed in the triturating process may have a neutralizing effect on the material thus helping in minimizing the impurities and toxicity of the drug.
3. *Bhavana* with organic juices improves the bioavailability of the drugs thereby enhancing their rate of absorption.
4. The *Bhavana* process helps the contents to convert into fine particles through continuous rubbing and attrition. The force applied due to these processes helps to increase the surface area of the material.
5. Liquid media put in mass to the final product thus varying percentage of constituents.
6. Wet trituration may modify parameters of standardization of tablets i.e. Dissolution, Disintegration, Hardness and Friability which in turn facilitates the absorption process³⁵.
7. Enhancement of therapeutic properties in minerals, metals, and even plant materials. Thus *Bhavana* process shows multidimensional pharmaceutical and therapeutical implications in Ayurvedic pharmaceuticals.

3.8 *Kupipakwa* Preparations

Kupipaka is a special type of heating system, adopted for the preparation of *Rasasindura*, *Rajat sindura*, *Mallasindura*, *Talasindura*, *Makardwaja*, *Sameerpannaga*, *Swarnavanga*, etc. formulations³⁶. As the glass bottle is used for the process (*kupipaka*), the product is known as *Kupipakwa* preparation. The final product is red coloured like *sindur*. Hence these preparations are also known as *Sindura Kalpa*.

Steps involved in *Kupipakwa* preparations.

1. First, prepare *Kajjali* (black collyrium-like powder) of mercury and sulphur and place in a glass bottle (1/3rd full) smeared with seven layers of mud and cloth, dried and buried in *Valuka yantra* (an instrument filled with sand) up to its neck

and subjected for the mild, moderate and intense manner of heating.

2. Insert a red-hot iron rod into the *kachkupi* (glass bottle) through its opening and stir frequently so that, the opening of the bottle may not be choked by a thick coating of subliming sulphur.
3. When fumes stop, the mouth of the bottle is corked and sealed.
4. After this, the strong heat may be applied for at least two more hours to allow the prepared compound to sublime and adhere to the neck of the bottle.
5. When the bottle gets cooled, it is removed carefully and broken in the middle to separate the upper and lower halves of the body of the glass bottle.
6. The medicine deposited at the neck is scrapped, collected and stored in a well-stoppered bottle. This is called *kupipakwa Kalpa* and is known by different names as per the ingredients used.

Recently *Valuka yantra* (an instrument with sand) was replaced by the electrically heated muffle furnace where heating is done with the regulation of temperature. Particular chemical processes are involved in these preparations which denote the sound chemical knowledge prevailing in ancient India. This is also evident from the facts that;

- Though classics mention containers of different materials, glass bottles are preferred owing to their easy availability and handling and heat resistant capacity (withstand temperature changes up to 1000°C).
- To make it more heat stable seven layers of mud-smearred cloth are applied. *Multhani mitti* (fuller's earth) is preferred for application as it is soft and easily spreadable.
- *Valukayantra* made of sand can be preferred as the specific heat capacity and Sand can retain heat for a very long period as the heat transfer coefficient is very low. This may prevent the abrupt heat variation thereby promoting gradual heating.
- Wooden, plaster of paris or brick material can be used for corking the bottle as it is easily available, economical and inert.

3.8.2 Impact of Kupipakwa Preparations³⁷

Many alchemical principles and observations are involved in the process of *Kupipakwa* preparations. In

these preparations, Mercury (Hg), Sulphur (S), metals and minerals have been used extensively to bring about the expected chemical alterations in the final product. When mercury is processed with metals it forms an amalgam which is responsible for the formation of an intermediate product.

1. Black sulphide of mercury (*Kajjali*) becomes red on sublimation. On heating, the unstable black form is transformed into stable red form i.e., Red sulphide of mercury (*Rasasindura*).
2. In most of the *Kupipakwa* preparations, a sublimation process is involved. It is the unique chemical process of converting a solid directly into vapour and condensing the vapour into a solid state having the same composition.
3. *Rasasindura*, *Makardwaja* and *Rajat Sindura* possess the same chemical formula-HgS but differ in the crystal structure. Change in the crystal structure can occur due to embedded metal ions in the crystal system. Thus *Kupipakwa* preparations are the outcome of complex chemical processes.

4. Conclusion

Processing (*Samskara*) has a great impact on *Ayurveda* pharmaceutics. The availability of genuine and standard material with proper processing is essential for the production of safe and effective medicines. A faulty process can spoil the products. Quality and Quantity of material, the quantum of heat, time duration of the processing, container and environmental conditions are the important factors to be taken into consideration during the medicine preparation. One can achieve desirable physical, chemical or therapeutic properties in the final product if these processes are followed with caution. Several pharmaceutical dosage forms can be achieved following basic processing methods described in *Ayurveda* but one can do wonder if these processes will be combined with modern technological processes.

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