

## A REVIEW ON MIXING METHODOLOGY IN AYURVEDA

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### ABSTRACT

Mixing can be defined as the process in which two or more than two components in a separate or roughly mixed conditions are treated in such a way that each particle of any one ingredient lies as nearly as possible to the adjacent particles of other ingredient or component. It is difficult to find a pharmaceutical product in which mixing is not done at one stage or the other during its manufacturing. A wide variety of materials such as liquids, viscous liquids, semi-solids and solids require mixing. In Ayurveda mixing is a kind of *samyoga samsakara* performed with an aim of potentiating or changing therapeutic effect of medicine. Here various procedures are adopted to mix liquids, powders as well as solids where their action gets potentiated through the process of synergism. Even semi-solid preparations require mixing too.

**Keywords:** Mixing, Mardana, Bhavana, Mathana, Samyogasamskara.

### INTRODUCTION

Mixing can be defined as the process in which two or more than two components in a separate or roughly mixed conditions are treated in such a way that each particle of any one ingredient lies as nearly as possible to the adjacent particles of other ingredient or component<sup>1</sup>. Process of mixing is one of the most commonly used operations in daily life. It is difficult to find a pharmaceutical product in which mixing is not done at one stage or the other during its manufacturing. In Ayurveda mixing is a kind of *samyoga samsakara* performed with an aim of potentiating or changing therapeutic effect of medicine. Samyoga is nothing but combination of two or more drugs. This will vary according to different type of drugs and dosage forms. Here various procedures are adapted to mix solids, liquids, as well as

powders where their action gets potentiated through the process of synergism. Even semi-solid preparations require mixing too. Mainly degree of mixing depends on purpose of the final product and the objective of the mixing operation. Mixing ensures the uniformity of composition between the mixed ingredients which may be determined by taking samples from the bulk material and analyzing it. This should represent overall composition of the mixture. Mixing initiates or enhances the physical or chemical reactions like diffusion, dissolution etc.

Generally mixing is carried out to obtain following types of products:

- 1) To obtain a true solution by mixing two or more than two miscible liquids.

- 2) To prepare an emulsion by mixing two immiscible liquids in the presence of an emulsifying agent.
- 3) To prepare a suspension by mixing an insoluble solid with a vehicle.
- 4) To prepare a solution by mixing a solid in a vehicle.
- 5) An ointment is prepared by mixing solid or liquid with a semi solid base.
- 6) When two or more than two solid substances are mixed together, a powder is obtained which when filled into capsule shell is known as capsules and when compressed under heavy pressure is called tablets<sup>2</sup>.

#### **MECHANISM OF MIXING:**

**Convective mixing:** During convective mixing transfer of groups of particles in bulk take place from one part of powder bed to another.

**Shear mixing:** During shear mixing, shear forces are created within the mass of the material by using agitator arm or a blast of air.

**Diffusive mixing:** During this mixing, the materials are tilted so that the gravitational force cause the upper layers to slip and diffusion of individual particles take place over newly developed surfaces.

#### **SOLID MIXING:**

##### **Mixing of powders:**

Powder mixing is a process in which two or more than two solid substances are intermingled in a mixer by continuous movement of the particles. Mainly the object of the mixing operation is to produce a bulk mixture which when divided into different doses; every unit of it must contain the correct proportion of each ingredient. It is widely used in the preparation of powders,

capsules and tablets in the pharmaceutical industries.

##### **Equipment used for powder mixing by modern pharmaceuticals:**

Pestle and mortar, spatula, sieves, tumbler mixers, agitator mixers etc.

##### **Mixing of semi - solids:**

Many semi-solids form neutral mixture because they have no tendency to segregate although sedimentation may occur.

Agitator mixers are used for the mixing of semi-solids. They work on the same principle as that used for mixing the liquids and powders. The arms of the agitator are designed in such a way that they produce pulling and kneading action and also clear whole of the material from all sides and corners of the mixing vessel. Even triple roller mill is preferred in case of semi-solid mixing.

#### **LIQUID MIXING:**

It consists of two groups:

##### **A. Mixing of liquids and liquids:**

1) Mixing of two miscible liquids (homogeneous mixtures): It is quite easy and occurs by diffusion. Simple shaking or stirring is enough but if the liquids are not readily miscible or if they have different viscosities then electric stirrer may be used.

Eg: Solutions

2) Mixing of two immiscible liquids (heterogeneous mixtures): It is done in the presence of an emulsifying agent. So here to produce a stable product mixing must be very efficient i.e continuous without ceasing because the components tend to separate out if continuous pressure is not applied on them. Eg: Emulsion

### **B. Mixing of liquids and solids:**

1) Mixing of liquids and soluble solids (homogeneous mixtures): In this case soluble solids are dissolved in a suitable liquid by means of stirring. It is a physical change as soluble solids are converted into a solution.

2) Mixing of liquids and insoluble solids (heterogeneous mixtures): When insoluble solids are mixed with a vehicle a suspension is produced which is an unstable system. The ingredients of a suspension separate out when allowed to stand for some time. Hence a suspending agent is added to obtain a good suspension.

#### **Equipment used for liquid mixing:**

**Shaker mixers:** In these mixers, the material present in the containers is agitated either by an oscillatory or by rotatory movement.

**Propeller mixers:** These are the most widely used mixers for liquids of low density. It rotates at a very high speed i.e. upto 8000 revolutions per minute due to which mixing get completed in a short period.

**Turbine mixers:** This generally consists of a circular disc impeller to which a number of short, straight or curved blades are attached.

**Paddle mixers:** In some of the liquid mixers, a number of paddles are used as impellers which consist of flat blades attached to a vertical shaft and rotate at a low speed of 100.r.p.m or less. The blades have a larger surface area in relation to the container in which they are employed which helps them to rotate close to the walls of container and effectively mix the viscous liquids and semi-solids.

#### **Concept of Mixing in Ayurveda:**

### **SOLID MIXING:**

#### **Mixing of churnas:**

Instruments like *khalwa yantra* (mortar and pestle), spoon are used for the mixing of *churnas* (powders). They are subjected for the process of *mardana* (trituration) until powders are properly mixed.

#### **Mechanism:**

While doing *mardana peshani* (pestle) due to its weight puts pressure on the particles, makes them still smaller in size and may result in aggregation of particles. Even it is told that by *mardana* improvement in *guna* (quality) takes place. It helps to remove *bahirmala* (external impurities)<sup>3</sup>. Eg: Shuddha vatsanabha and tankana churna

#### **Mixing of semisolids and churnas :**

In the preparation of *malahara kalpana* and *avaleha kalpana* there is mixing of semi - solids and powders by subjecting it to certain temperature. In the preparation of *gandhakadya malahara*, *sikthataila* is melted and added with powders of *girisindura* (red oxide of mercury), *shudha gandhaka* (purified sulphur), *shudha tankana* (purified borax) and *karpura* (camphor), slowly mixed with pressure<sup>4</sup> by rotating spatula over the ingredients. In case of *avaleha kalpana* after observing *avaleha siddhi lakshana prakshepaka dravyas* are added which will be in powder form and the final product will be in semi-solid form. Here in both the *kalpanas* vigorous mixing is must in the presence of certain temperature as both solidifies when it is cooled.

### **MIXING OF LIQUIDS IN AYURVEDA:**

#### **Liquid –liquid mixing:**

In the preparation of *rasa karpura, parada* (mercury) is mixed with *gandhakamla* (concentrated sulphuric acid) by means of

heating<sup>5</sup>, where initially liquid content gets evaporated and *parada* remain mixed with *gandhakamla*, then it is shifted to a *khalvayantra* and triturated further for their proper mixing.

**Mechanism:**

Here heat given and trituration done are having their role to play in mixing and reduction of particle size.

**Liquid-solid mixing:**

Procedures like *mathana*, *bhavana* and even heating is done to mix liquid with solids.

In case of *basti kalpana (enema)* while preparing *niruha basti (decoction enema)* mixing is done with *khaja (churner)*<sup>6</sup>. Ingredients like *madhu* (honey), *lavana* (salt), *taila* (oil), *kalka* (paste), *kwatha* (decoction) are added<sup>7</sup> one after the other and *mathana* (churning) is carried out using churner. Initially *madhu* is taken, *lavana* is added to it, churned until *lavana* is completely dissolved in it. Then *taila* is added, churned until it is uniformly mixed and *taila* should not separate out. It is followed by addition of *kalka*, churned so that particles of *kalka* should not settle down. Finally *kwatha* is added and churned vigorously to obtain a homogeneous mixture. Homogeneity of final mixture is assessed by the features mentioned for *suyojitha niruha*<sup>8</sup>.

While preparing *shankha bhasma*, *bhavana samskara* (levigation) is selected to mix *kumara swarasa* and *shuddha shankha churna*. Here instrument like *khalva yantra* is used. At large scale work wet grinders, edge runner mill and end runner mills are used for the same purpose.

In the preparation of *panchakola phanta*, initially *churnas* are prepared out of drugs

mentioned under *panchakola*, treated with *ushnajala* (hot water), and then it is filtered and used. Here properties of five drugs are received into liquid form.

**Mechanism:**

In *mathana* the pressure applied through the *khaja*(churner) over the liquid in a vessel will make the particles to move in circular motion, they will get moved to the sides of vessel and will get bounced back. So this will make particles to get reduced into smaller size. Here *madhu* acts as an emulsifying agent.

In case of *bhavana* the pressure put on the material by the weight of the stone in the instrument facilitate easy mixing and particle size reduction.

In *panchakola phanta* each one of the drug and *ushnajala* are having their own role in enhancing the digestive power of a person. To combine their properties mixing is adopted in the presence of *agni*. So the final product is potentiated much more than the single drug.

**SAMYOGA AS A SAMSAKARA:**

*Samyoga* is nothing but combination of two or more substances. It is included under *paradigunas* and having following types:

- 1) *Eka karmaja samyoga*
- 2) *Dwandva karmaja samyoga*
- 3) *Sarva karmaja samyoga*.

Based on *karya* it is divided into 1) *Bhautika samyoga* 2) *Rasayanika samyoga* Eg: *bhavana*. *Samskara* is nothing but the procedure adopted to enhance the natural quality of drugs to potentiate/enhance the overall action of final product. Eg: *mardana*, *bhavana*, *mathana* etc. *Mardana* of *vatsanabha* with *tankana* in a formulation will result in efficient usage of its *vyavayi*

and *vikasi* properties by protecting patient from untoward effects. *Samyoga* of *ksheera* with *sharkara* will enhance the *guna* of *ksheera* while mixing it with *amladravyas* considered to be *viruddha*. Similarly when *madhu* is mixed with *ghrita* in unequal proportion is considered as a medicine while their *samyoga* in equal proportion is considered as *visha*. *Bhavana* of *amalaki churna* with *amalaki swarasa* enhances the property and potentiate the action of final product so that minimum dosage would be sufficient<sup>9</sup>. So *samyoga* or mixing is effectively utilized in Ayurveda.

## **DISCUSSION**

### **Solids mixing:**

In the preparation of churnas in a formulation there will be more than two or three drugs. Their quantity may be in equal or in different proportion. If they are not mixed properly then ingredient in larger quantity will settle down and will become an improperly mixed formulation. There will be unequal distribution of ingredients in each dose. Hence the purpose will not be served because of which final product may not give the desired result. So it is necessary to mix all the ingredients in such a way that each particle lies close to each other resulting in potential formulation.

In *avaleha kalpana* after observing *lehasiddilakshana prakshepaka dravyas* are added and allowed to cool, but in *malahara kalpana* the base remain in liquid form only when it is on fire hence addition of the ingredients are done at hot stage itself. So in both semi-solid preparations mixing is easy and possible only in the presence of heat as both get solidified once it is cooled.

### **Liquids mixing:**

In case of *rasakarpura* concentrated sulphuric acid mixed with *parada* in the presence of heat, so here heat is an important factor in mixing the drugs.

In the context of *mathana*, rapid mixing in circular motion is required to combine the drugs which are immiscible with each other like *madhu*, *taila*, *Kashaya* etc while preparing *basti* formulation.

*Agni* plays an important role in the preparation of *panchakola phanta*. The properties of churnas are extracted into liquid only in hot condition.

To mix a solid with a liquid just placing in a container will not be sufficient as they will remain as it is, so to get the action of liquid into solid, their combination will be subjected to a process called *mardana* and *bhavana* which helps in *gunavardana*.

Hence the concept of mixing is given equal importance in Ayurveda in the name of *samyoga samskara* in order to potentiate the final product/formulation.

## **CONCLUSION**

Mixing is the *samyoga samskara* which is different for different dosage forms. This concept is explained mainly to convert heterogeneous compound to homogenous compound, making it more suitable to the body. It helps in the even distribution of ingredients throughout the product. Hence it is necessary that mixing is properly performed to potentiate the formulation or the final product.

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